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By Chris Sandham-Bailey

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# INTRODUCTION

During the latter half of the 20th century Western Europe lived in perpetual fear of an attack from the East. Countering this threat meant the defences of NATO had to be continually reinforced with the latest technologies – resulting in the Cold War arms race.

While any actual strike was thought likely to end in mutually assured destruction, the intervening period would see intense action as the two sides met. Air superiority would be essential, as had been proven during the Second World War, since it was vital for the bombers to get through with their nuclear payload.

Despite the world teetering on the brink of war for many years, or perhaps because of it, the Royal Air Force and British aviation in general enjoyed a new golden age. The inventions of the 1939-45 war, the jet engine and radar, provided springboards for exciting new projects which were in constant development, the brand new aircraft amazing crowds at the annual SBAC shows at Farnborough.

Glamorous test pilots broke the sound barrier and futuristic aircraft such as the English Electric P.1 and the behemoth that was the Avro 698 mesmerised spectators. Both types went on to become iconic aircraft (the Lightning and Vulcan) that every schoolboy dreamed of one day flying.

As the threat from the USSR and Warsaw Pact nations continued to remain a presence in military planning, the roles required of aircraft evolved. Despite the RAF having proven the benefits of operating from temporary airstrips both during the Battle of Britain and as they leapfrogged from airfield to airfield after D-Day, the jets of the postwar years necessitated hard runways of increasing length to accommodate their greater weight and the distance they required to get airborne.

In later years, both the Jaguar and Harrier were designed to operate in the field should the worst come to the worst and the airfields were lost during a first strike. The Harrier could operate from literally anywhere and the Jaguar was capable of using the autobahns of West Germany.

Bombers which were looking obsolete in their primary role as a nuclear deterrent, due to the submarine fleet taking over that role, were converted to tankers, allowing the RAF to reach any part of the globe; the most famous example being the Black Buck raids when the Victor tanker fleet helped Vulcan bombers reach the Falkland Islands.

While there was never a direct conflict between East and West there were many proxy wars where the RAF and British-designed aircraft were involved. The possibility of a 'domino effect', where one national after another fell to communism, was a constant worry in the Far East and while it was not involved in the Vietnam War the RAF had a presence in the region for many years.

Royal Navy fighters may have seen action during the Korean War but the RAF was used during the Malayan Emergency and was a permanent presence in Singapore where everything from the Meteor to the Javelin was based.

In the Middle East, the RAF retained a presence for many years with several types seeing action during the Suez Crisis. The RAF Luqa, Malta, and RAF Akrotiri, Cyprus, bases saw everything from Venoms to Valiants while British and French forces attempted to retake the canal and topple Nassar, the Egyptian president.

Further south at RAF Khormaksar, the RAF saw prolonged action while trying to protect the sovereignty of Aden against various guerrilla groups, eventually pulling out in 1967.

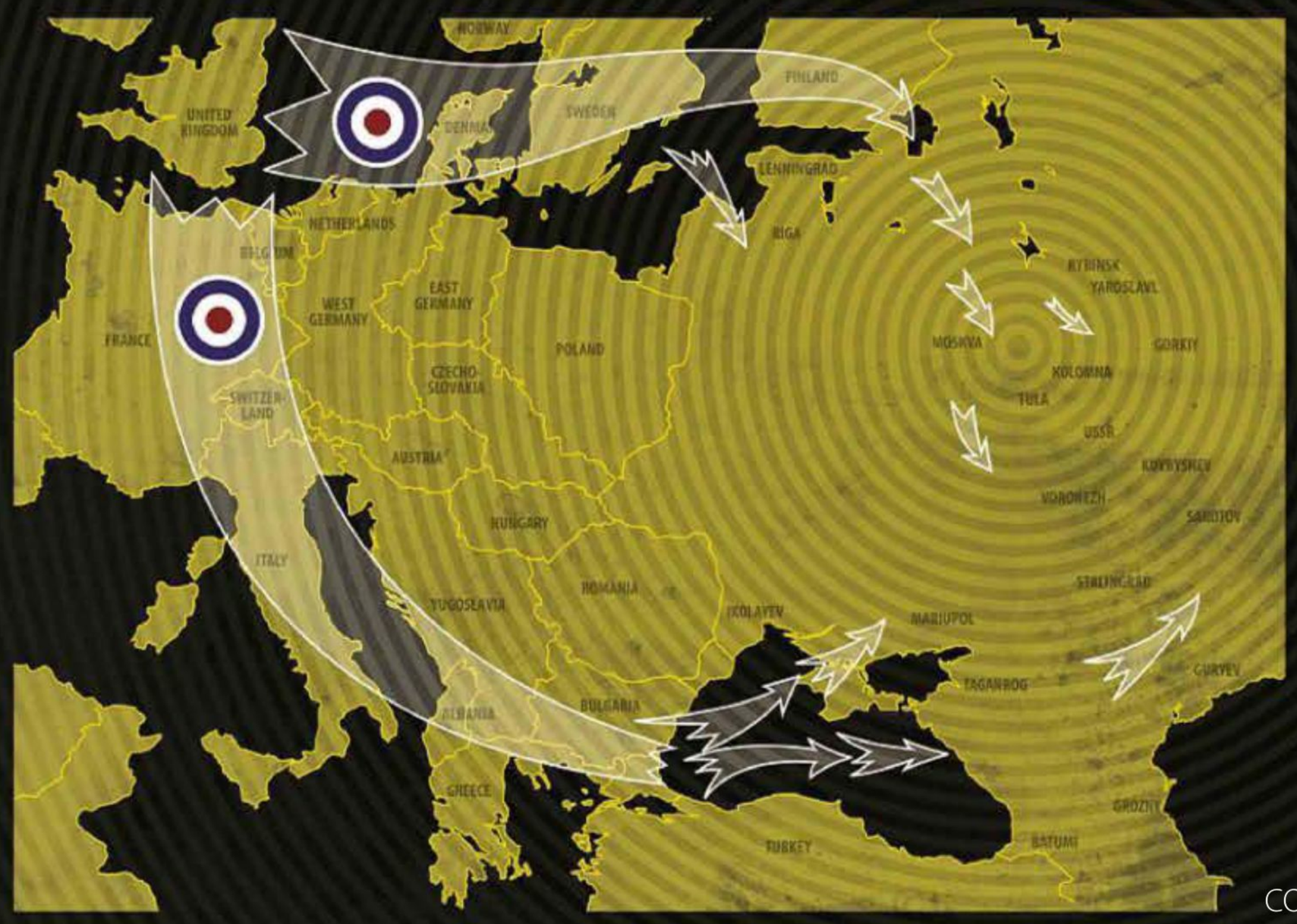
During the 1970s the RAF retained a sizable presence in West Germany and fighters remained on standby in the UK for Quick Reaction Alert to intercept Soviet aircraft that probed British airspace, something that has continued into the 21st century. During 1982 the RAF played a vital role in the Falklands War with Harriers, Vulcans and Victors all being involved. The following decade saw the end of the Cold War but the jets built as a result of it continued to be used during the Gulf War and later in the Balkans.

The soaring cost of combat aircraft has resulted in an ongoing reduction in the size of air forces around the globe and the threats to peace in the early 21st century are no longer as clear cut as they were during the Cold War when it was the East versus the West. This, combined with the ever-increasing use of drones, means we are unlikely to ever again see an RAF as large or impressive as it was during the Cold War.

There is no official consensus on when the Cold War started and ended but it is generally agreed that it covered a period from around 1947 to 1991, so all the main front line jets used by the RAF during this time have been included here. Some early and post-Cold War schemes have been included too, due to their significance in relation to the type. Most of the dates for types are based on the first flight of the initial prototype which led to the production aircraft, but in some cases where they have evolved from other types the later date has been given.

There are some notable types absent that provided a vital role and have their own aficionados, including the Phantom, the Nimrod and the Tornado which was a result of the Cold War but is currently still in service. Other absent jets include the Provost, Gnat and Hawk, these three being used as trainers by the RAF. Due to the limited number of pages available, not type could be covered so the aircraft featured have been limited to front line British-built fighters and bombers that are no longer in service with the RAF.

Although the Jaguar was an Anglo-French collaboration and the second generation Harriers were of largely American in design, they were still a derivative of the original Hawker P.1127.



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Words and illustrations:
**CHRIS SANDHAM-BAILEY**

Design:
**GARETH WILLIAMS**

Publishing director:
**DAN SAVAGE**

Publisher:
**STEVE O'HARA**

Reprographics:
**JONATHAN SCHOFIELD & PAUL FINCHAM**

Production editor:
**DAN SHARP**

Marketing manager:
**CHARLOTTE PARK**

Commercial director:
**NIGEL HOLE**

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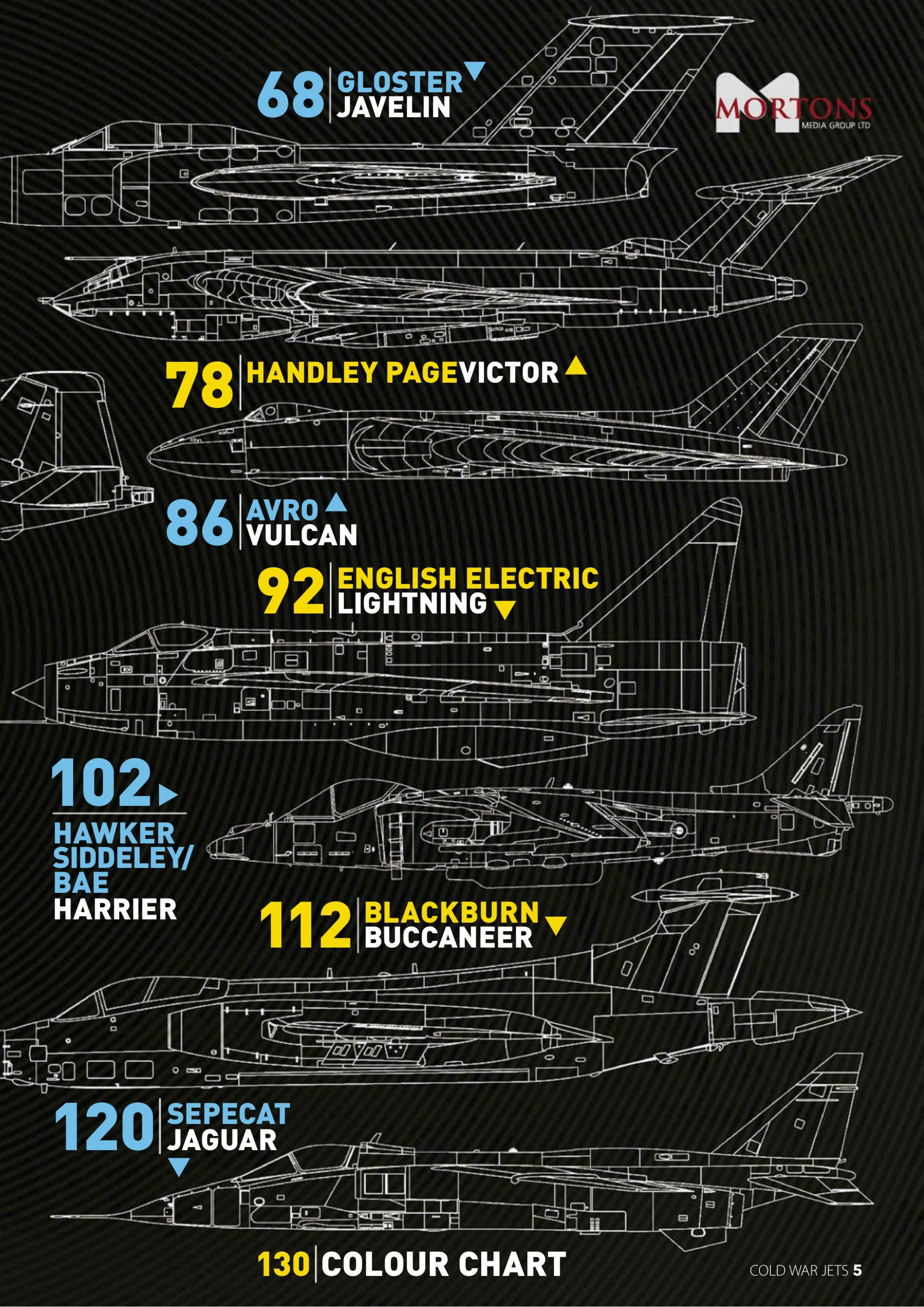


1943-2004

**The Meteor has the distinction of being the first and only Allied jet to see active service during the Second World War, the introduction of the new jet making every other Allied fighter obsolete at a stroke. But the career of the Meteor was dominated by service during the cold war. Squadrons were based in Germany as the Iron Curtain descended and remaining there until replaced. The type continued to fly with the RAF in secondary roles for many more years and saw exports to numerous countries, which were eager to embrace the dawning jet age. Many Meteors have survived in museums across the globe with a small number being maintained in flying condition.**

# GLOSTER METEOR

With the successful early flights of the Gloster E28/39, which proved Sir Frank Whittle's new turbojet engine, it was evident that the future of combat and aviation lay with the new form of propulsion. At this stage the output of the engines was insufficient for a single unit to power a fighter on its own while making the most of the speed that could be available.

Therefore it was proposed in specification F9/40 that two engines would be used and armament would consist of four 20mm Hispano cannon (originally six were intended but due to weight issues the number was reduced). Having already worked closely with Whittle's company Power Jets Ltd, Gloster was the logical choice for the design. An initial order was place for 12 aircraft. In total eight prototypes were eventually built, DG202-DG209.

Recognising the potential, Gloster was instructed by Lord Beaverbrook to concentrate on the new Twin Engined Whittle Fighter. Informally the project was known as Rampage followed by Thunderbolt but with the P-47 in service, the name Meteor was settled on eventually to avoid confusion.

Despite the demands of the war on resources, progression on the airframe design and construction was relatively

## GLOSTER METEOR F.8 WH480 41 SQN

**Delivered on in January 1952, WH480 served exclusively with 41 Sqn until scrapped in January 1958. The aircraft initially wore the bands on the tails but these were later replaced with the fin flash. Finished in all over Aluminium.**

straightforward. The only radical departure from previous aircraft was the engines; in a layout analogous to the Westland Whirlwind, which had cannons in the nose and the engines mounted in the wings. Due to the majority of resources being taken up by the war effort in 1941, the construction of the Meteor was designed to make the most of existing machinery and minimum tooling was required for the parts.

The first Meteor to fly was the fifth prototype constructed, DG206 on March 5, 1943, at RAF Cranwell. Early testing was beset with complications, two of the prototypes being written off and a third severely damaged. One major delay was a breakdown in relations between Power Jets Ltd and Rover who were tasked with production of the early engines. In an effort to break the deadlock Rolls-Royce was appointed to the project, beginning the company's association with jet engines.

616 South Yorkshire Squadron had the honour of being the first to convert to the new jet. Initially two flights retained the Spitfire VII and only the third was equipped with the Meteor F.1, the first pilots beginning

**THE FIRST METEOR TO FLY WAS THE FIFTH PROTOTYPE CONSTRUCTED, DG206 ON MARCH 5, 1943, AT RAF CRANWELL.**

# COLD WAR JETS GLOSTER METEOR

## GLOSTER METEOR F.1 EE222 616 SQN

**Lost during the war when it was written off following a forced landing due to a fuel shortage on August 29, 1944, EE222 is thought to have been flown by Wg Cdr A McDowell of 616 Squadron. Finished in Dark Green, Dark Sea Grey camouflage with Medium Sea Grey underside and Sky band.**

their conversion course on June 6, 1944. The squadron was to receive its first Meteors a month later.

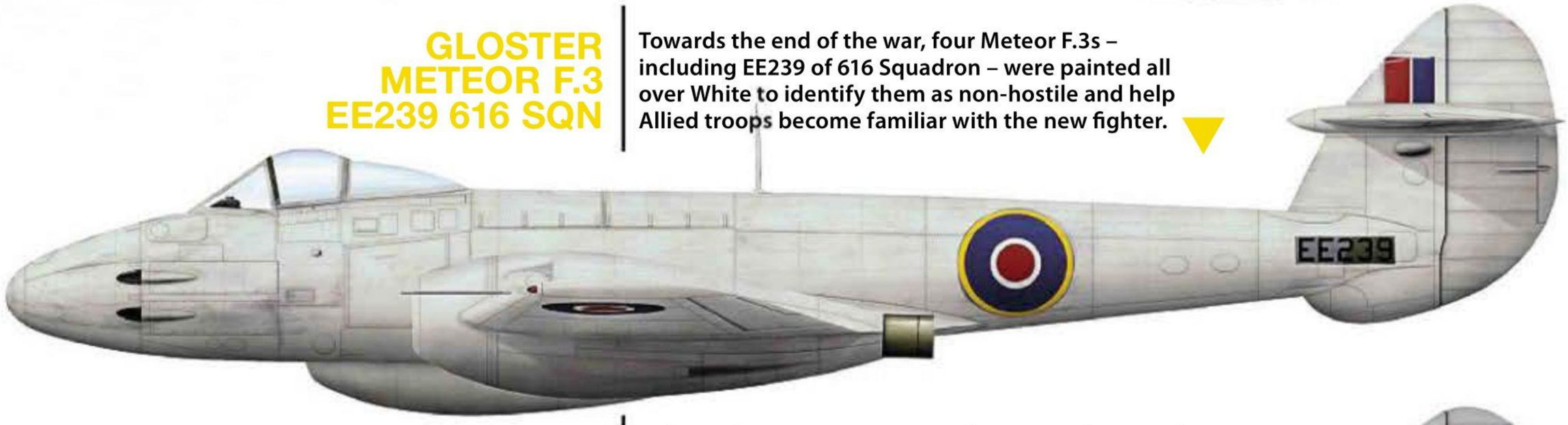
The biggest change for many fighter pilots was the two engines, but the slower acceleration and higher top speed also took some getting used to. Concern that the Germans may be able to reverse engineer the Meteor meant that operations were initially limited to flights over UK soil, 616 Sqn being tasked with V-1 interceptions.

By the end of the year the more powerful F.3 began to filter through and in February 1945 a flight of four Meteors were based at Melsbroek, Belgium. Most Allied troops had never encountered the Meteor and it was not uncommon for it to be mistaken for the Me 262. To remedy this the Meteors received an all over white wash. The F.3 served with 15 squadrons and 210 were constructed.

Further developments to the Meteor saw the introduction of the F.4 which had a more powerful engine, the Rolls-Royce Derwent 5 which was itself a scaled version of the new Rolls-Royce Nene, the extended intakes also allowed for a higher top speed and much greater rate of climb. The F.4 was also found to be a lot more manoeuvrable and amenable to aerobatics even being able to execute them with only one engine,

## GLOSTER METEOR F.3 EE239 616 SQN

**Towards the end of the war, four Meteor F.3s – including EE239 of 616 Squadron – were painted all over White to identify them as non-hostile and help Allied troops become familiar with the new fighter.**

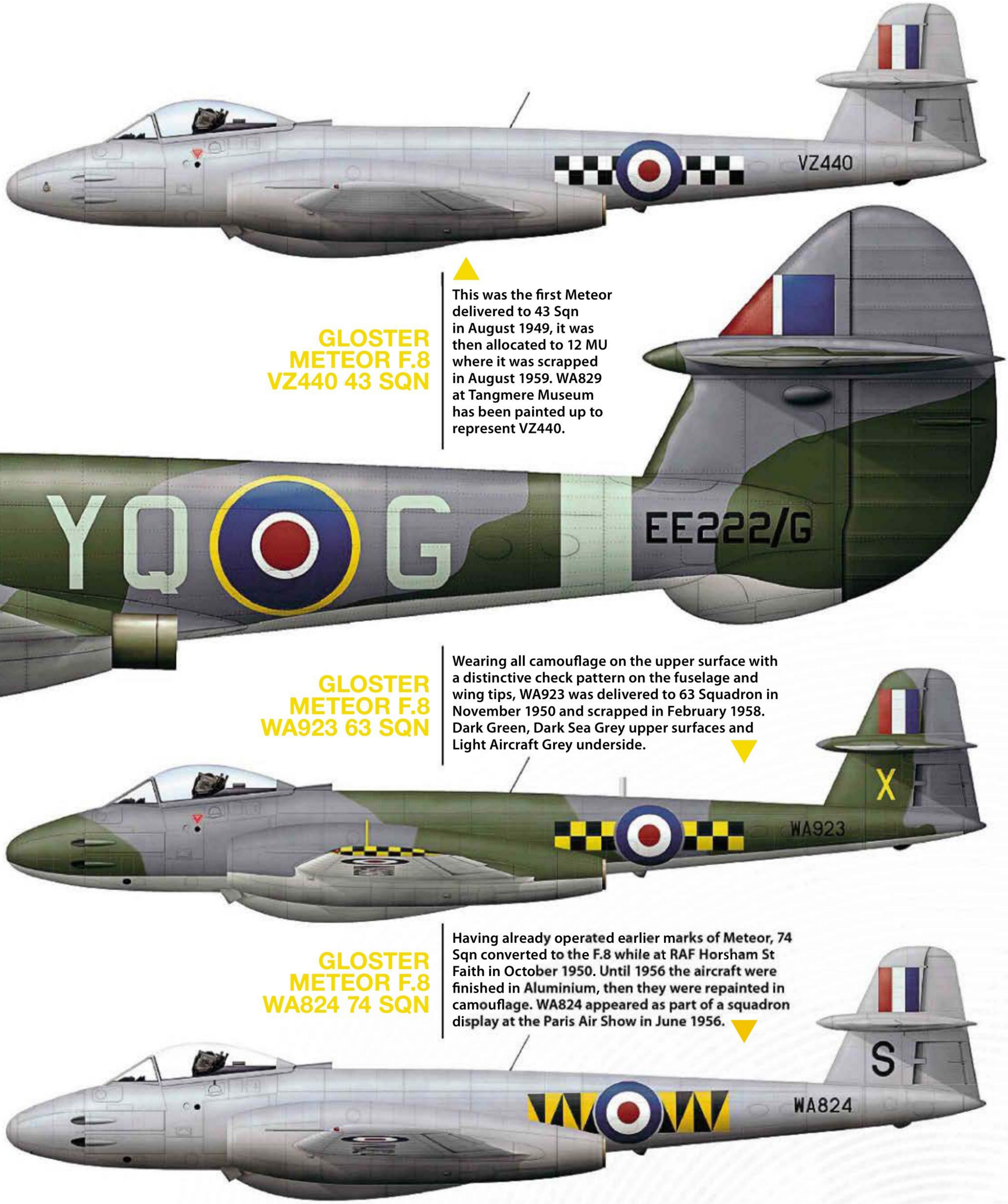



## GLOSTER METEOR F.4 VT282 74 SQN

**Delivered to 74 Sqn at RAF Horsham St Faith in October 1948, F.4 VT282 served during the early 1950s until replacement. It was converted to a U.15 drone in 1956 and shot down on September 8, 1960, off the coast of Malta while part of 728B NAS. All over Aluminium.**

## GLOSTER METEOR F.4 RA444 257 SQN

**Based at RAF Odiham, 257 Sqn's RA444 had the distinction of being the first jet to land in Dublin for a demonstration to the Irish Air Corps during May 1948. The squadron logo was worn on the nose.**




## GLOSTER METEOR F.8 VZ440 43 SQN

This was the first Meteor delivered to 43 Sqn in August 1949, it was then allocated to 12 MU where it was scrapped in August 1959. WA829 at Tangmere Museum has been painted up to represent VZ440.

## GLOSTER METEOR F.8 WA923 63 SQN

Wearing all camouflage on the upper surface with a distinctive check pattern on the fuselage and wing tips, WA923 was delivered to 63 Squadron in November 1950 and scrapped in February 1958. Dark Green, Dark Sea Grey upper surfaces and Light Aircraft Grey underside.

## GLOSTER METEOR F.8 WA824 74 SQN

Having already operated earlier marks of Meteor, 74 Sqn converted to the F.8 while at RAF Horsham St Faith in October 1950. Until 1956 the aircraft were finished in Aluminium, then they were repainted in camouflage. WA824 appeared as part of a squadron display at the Paris Air Show in June 1956.

an indication of the swift progress made.

Rapid advancements by Gloster's competitors meant that subsequent iterations had to be radically overhauled to keep up. This led to the F.8 – the final single seat fighter version of the Meteor.

Initially pilots were given a cursory tour of the cockpit and a copy of the pilot notes then told to get on with it. It soon became apparent that pilots found the change to flying jets a considerable challenge. So Specification T.1/47 outlined the need for a dual control jet trainer to reduce accident rates caused by unfamiliarity with the differences between piston engine and jet types.

F.4 G-AKPK had already been used as a company demonstrator and was selected for conversion. The fuselage was extended to accommodate the pupil and the aircraft (now designated the T.7) flew in this configuration for the first time on March 19, 1948. Another advantage of the lengthening was an improvement in directional

# COLD WAR JETS GLOSTER METEOR

## GLOSTER METEOR F.8 WH291 79 SQN

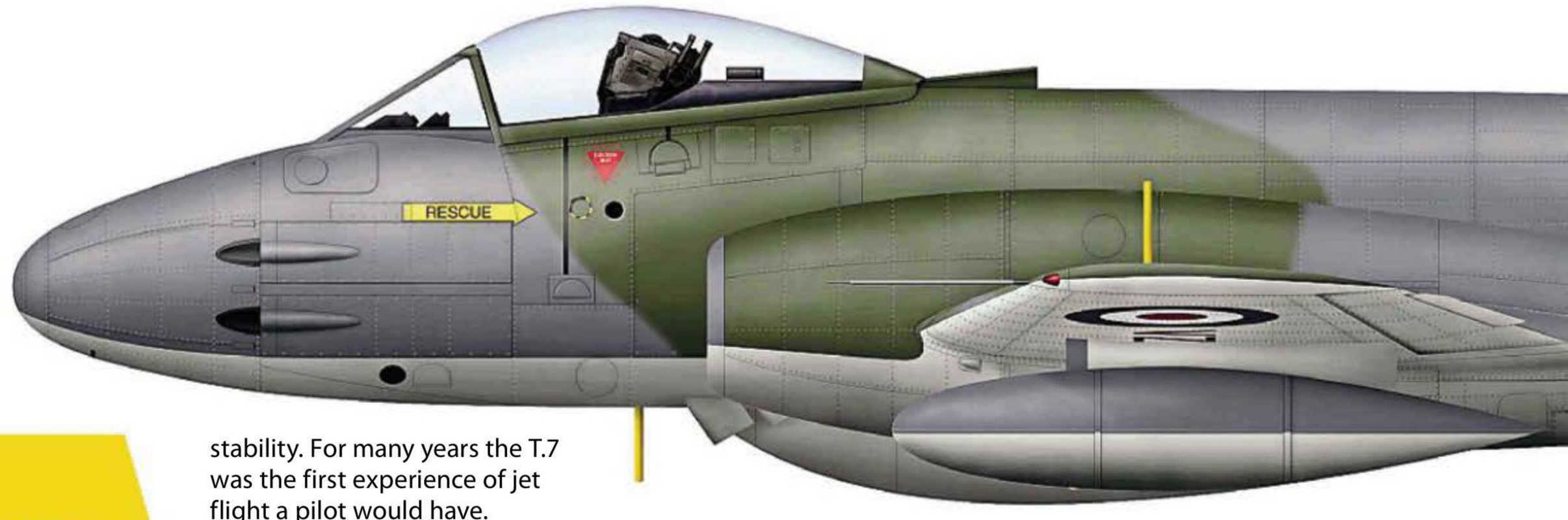
WH291 was delivered to 257 Sqn in November 1951. Following a wheels-up landing, it was eventually allocated to 229 OCU at Chivenor and painted in 79 Sqn (shadow unit) markings and all over Light Aircraft Grey during late 1970.

## GLOSTER METEOR F.8 WH301 609 SQN

Currently on display at the RAF Museum, Hendon WH301 served with 609 Sqn and later 85 Sqn. Still wearing these markings when it was acquired by the museum, it was repainted in the original markings in 1989.

## GLOSTER METEOR F.8 WH505 611 SQN

Flown by the leader of 611 Squadron during 1952, WH505 was later converted to U.16 and written off on September 27, 1962.

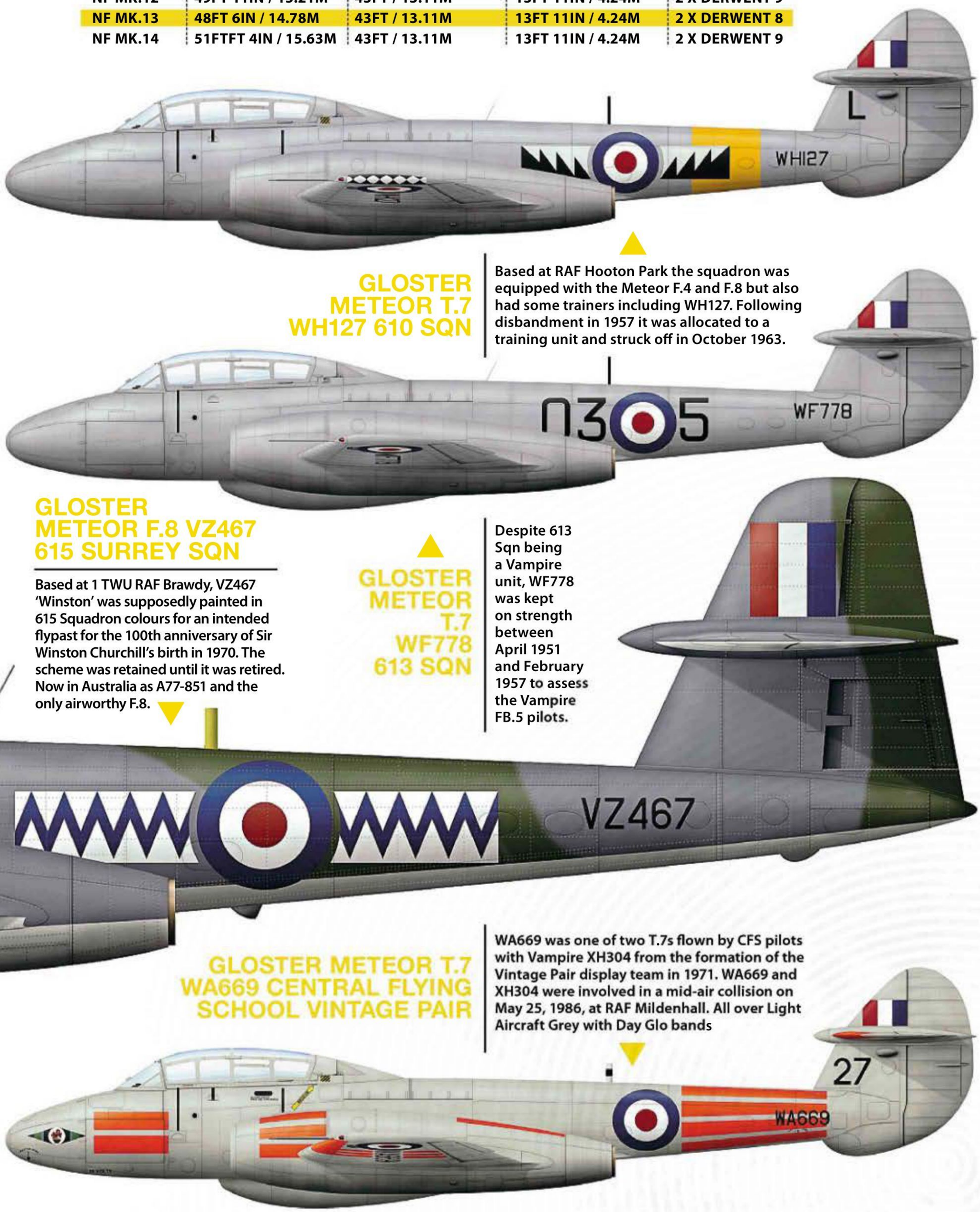



stability. For many years the T.7 was the first experience of jet flight a pilot would have.

Following the war, the RAF needed a replacement for the Mosquito night fighter which would be capable of matching the new jet bombers for speed, this ultimately led to the Gloster Javelin but until then an interim solution was required. Airborne interception relied on a radar operator guiding the pilot on to the intruder so the logical basis for a Meteor night fighter was the T.7.

Despite sounding simple the development and introduction of the NF.11 was a protracted affair. With the company's resources already heavily committed to the production of the single seat fighters, the programme was subcontracted to Armstrong Whitworth at Coventry. A number of changes had a substantial impact on the aircraft, radar equipment increased the weight requiring a greater wingspan and the more

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| F MK.I | 41 FT 5IN / 12.62M | 43FT / 13.11M | 13FT / 3.96M | 2 X WELLAND |
| F MK.II | 41 FT 5IN / 12.62M | 44FT 3IN / 13.49M | 13FT / 3.96M | 2 X GOBLIN |
| F MK.III | 41 FT 5IN / 12.62M | 43FT / 13.11M | 13FT / 3.96M | 2 X DERWENT 1 |
| F MK.4 | 41FT / 12.50M | 43FT / 13.11M | 13FT / 3.96M | 2 X DERWENT 5 |
| T MK.7 | 43FT 6IN / 13.26M | 37FT 2.5IN / 11.34M | 13FT / 3.96M | 2 X DERWENT 8 |
| F MK.8 | 44FT 7IN / 13.59M | 37FT 2.5IN / 11.34M | 13FT / 3.96M | 2 X DERWENT 8 |
| FR MK.9 | 44FT 7IN / 13.59M | 37FT 2.5IN / 11.34M | 13FT / 3.96M | 2 X DERWENT 8 |
| PR MK.10 | 44FT 3IN / 13.49M | 43FT / 13.11M | 13FT / 3.96M | 2 X DERWENT 8 |
| NF MK.11 | 48FT 6IN / 14.78M | 43FT / 13.11M | 13FT 11IN / 4.24M | 2 X DERWENT 8 |
| NF MK.12 | 49FT 11IN / 15.21M | 43FT / 13.11M | 13FT 11IN / 4.24M | 2 X DERWENT 9 |
| NF MK.13 | 48FT 6IN / 14.78M | 43FT / 13.11M | 13FT 11IN / 4.24M | 2 X DERWENT 8 |
| NF MK.14 | 51FTFT 4IN / 15.63M | 43FT / 13.11M | 13FT 11IN / 4.24M | 2 X DERWENT 9 |




## GLOSTER METEOR T.7 WH127 610 SQN

Based at RAF Hooton Park the squadron was equipped with the Meteor F.4 and F.8 but also had some trainers including WH127. Following disbandment in 1957 it was allocated to a training unit and struck off in October 1963.

## GLOSTER METEOR F.8 VZ467 615 SURREY SQN

Based at 1 TWU RAF Brawdy, VZ467 'Winston' was supposedly painted in 615 Squadron colours for an intended flypast for the 100th anniversary of Sir Winston Churchill's birth in 1970. The scheme was retained until it was retired. Now in Australia as A77-851 and the only airworthy F.8.

## GLOSTER METEOR T.7 WF778 613 SQN

Despite 613 Sqn being a Vampire unit, WF778 was kept on strength between April 1951 and February 1957 to assess the Vampire FB.5 pilots.

## GLOSTER METEOR T.7 WA669 CENTRAL FLYING SCHOOL VINTAGE PAIR

WA669 was one of two T.7s flown by CFS pilots with Vampire XH304 from the formation of the Vintage Pair display team in 1971. WA669 and XH304 were involved in a mid-air collision on May 25, 1986, at RAF Mildenhall. All over Light Aircraft Grey with Day Glo bands

# GLOSTER METEOR

**IT WAS THE VERY FIRST OPERATIONAL JET PRODUCED BY THE ALLIES AND ALMOST 4000 WERE BUILT**

powerful Derwent 8 engines. The 20mm Hispano cannons were moved into the wing, the nose now containing the radar and a new feature for the Meteor, a pressurised cockpit.

The NF.11 entered service with the RAF when WD599 was delivered to 29 Sqn at RAF Tangmere on August 20, 1951, before the month was out, a further seven had been delivered. The next version of the Meteor to enter service was the NF.13 (before the NF.12). This was a tropicalised version of the NF.11 with the introduction of air-conditioning. It was to serve in Egypt with 39 Sqn and 219 Sqn.

Development of the NF.12 was more complex than the straightforward alterations made to the NF.13. Externally, the NF.12 received aerodynamic improvements to the tail and nose, the latter being the result of the larger American APS-57 radar. The canopy and other features remained largely unchanged.

The final iteration of the Meteor was the NF.14 which was a refined version of the NF.12. A new canopy with improved all round vision was added. It also saw a further extension of the nose to accommodate the APQ-4 radar.

Many airframes went on to see a second life in a range of roles, some being converted to drones, others being used as target tugs. Along with newly built aircraft a lot of ex RAF Meteors were exported to the 17 countries which flew the Meteor. It was the very first operational jet produced by the Allies and almost 4000 were built.

**GLOSTER METEOR T.7 WF791**

**Delivered to the RAF in March 1951 the aircraft was displayed by the CFS first as part of the Vintage Pair and latterly as a solo display until it was written off at Coventry on May 30, 1988.**

**GLOSTER METEOR NF.14 WS800 60 SQN**

**Based at RAF Tengah, Singapore, 60 Sqn received NF.12s and NF.14s between October 1959 and Feberuary 1960. WS800 was one of the first two to arrive and flown by the squadron CO.**

## GLOSTER METEOR NF.11 WM293 68 SQN

Wearing 68 Squadron colours on its tail in place of the fin flash, WM293 was flown by the CO while based at RAF Wahn, West Germany.

## GLOSTER METEOR NF.14 WS841 HMT 264 SQN

The squadron replaced their Mosqutos with the NF.11 in 1951 and latterly the NF.14 during 1954 until disbanded in 1954. WS841 is notable in having an all-black tail.

## GLOSTER METEOR NF.14 WS729 25 SQN

25 Sqn operated a mix of NF.12 and NF.14s from March 1954 until June 1958. WS729 was delivered new to the squadron as part of the conversion process and scrapped in January 1961.

## GLOSTER METEOR NF.13 WM317 39 SQN

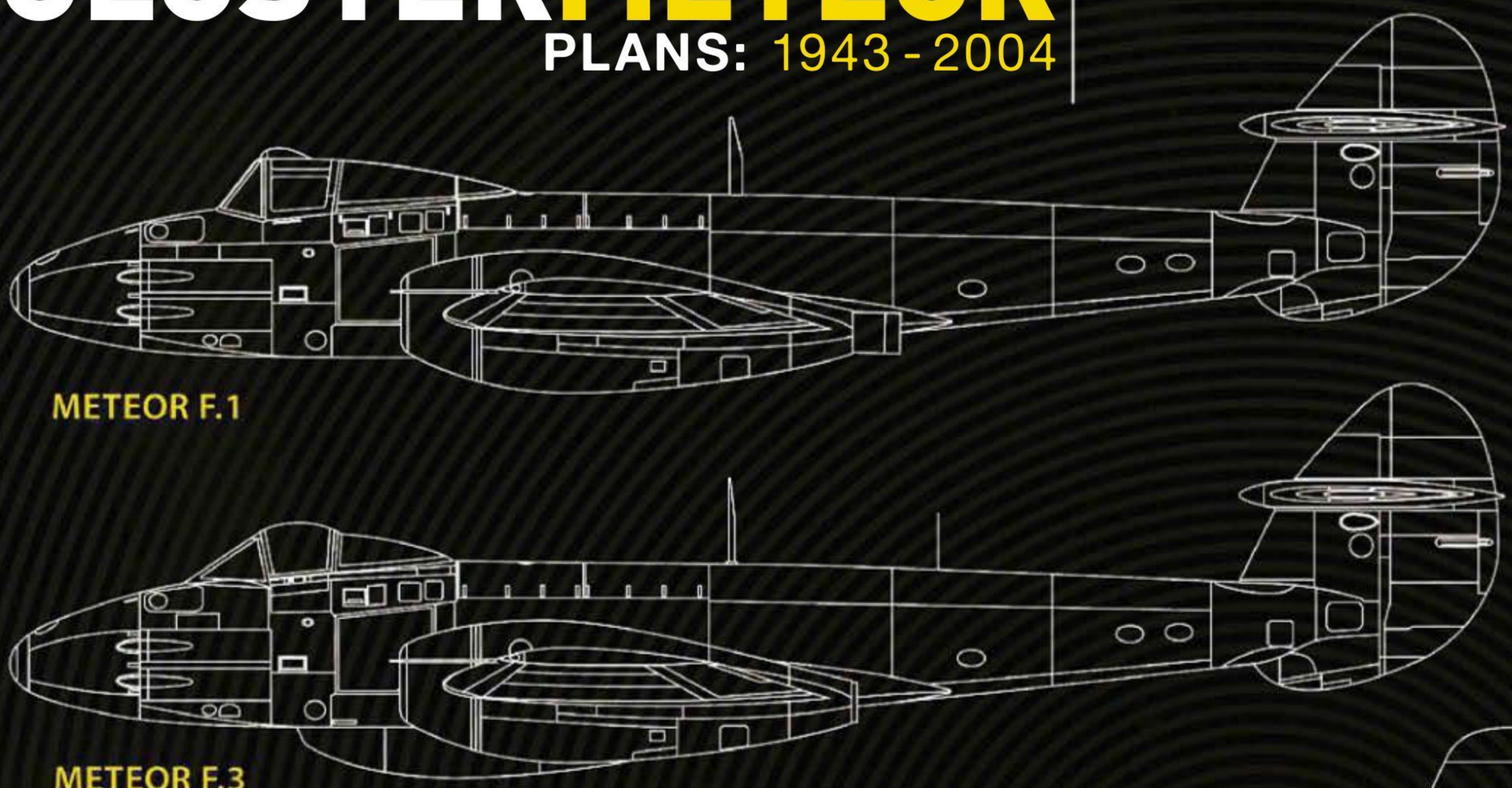
CWearing the black and yellow identification markings of the Suez Crisis, 39 Sqn were based at RAF Luqa, Malta, but were also at RAF Nicosai during the crisis.

## GLOSTER METEOR D.16 WK800

WK800 was constructed as an F.8 and served with the Royal Australian Air Force as A77-876 including time in Korea with 77 Sqn. It returned to the UK in 1971. Reverting to the WK800 serial it was converted to the D.16 drone configuration and operated at Llanbedr. Painted in gloss Red and Yellow.

# GLOSTER METEOR

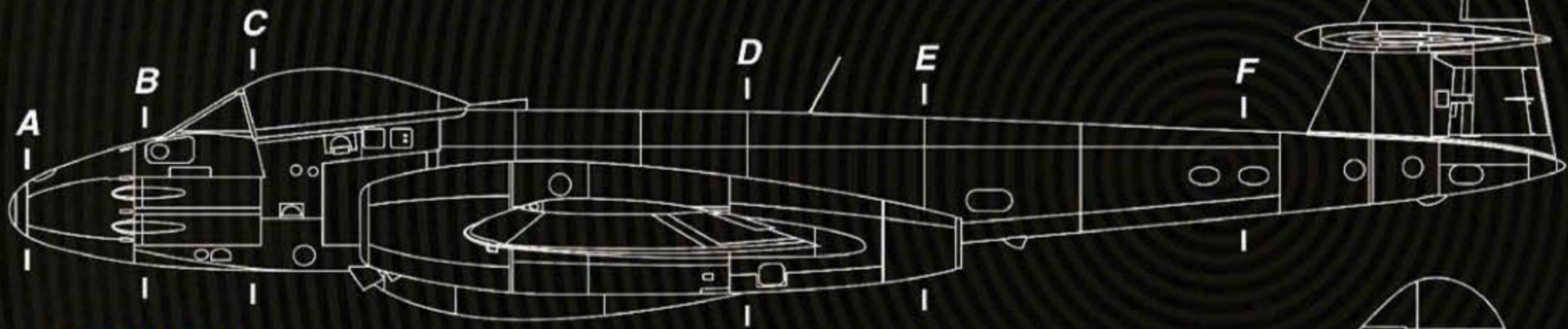
## PLANS: 1943 - 2004



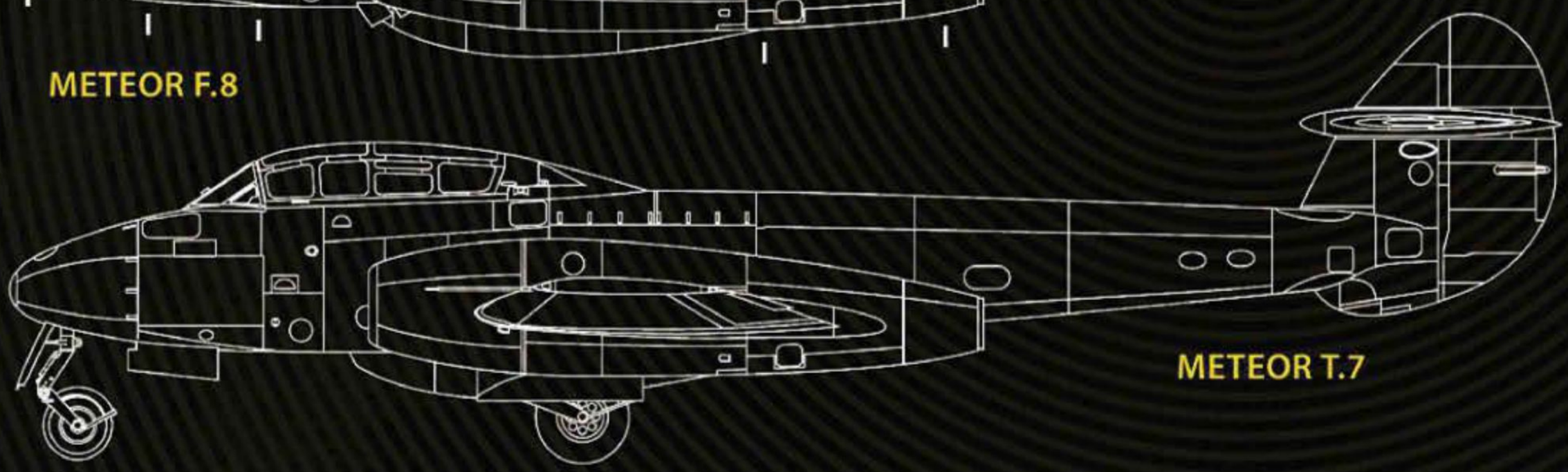
METEOR F.1



METEOR F.3



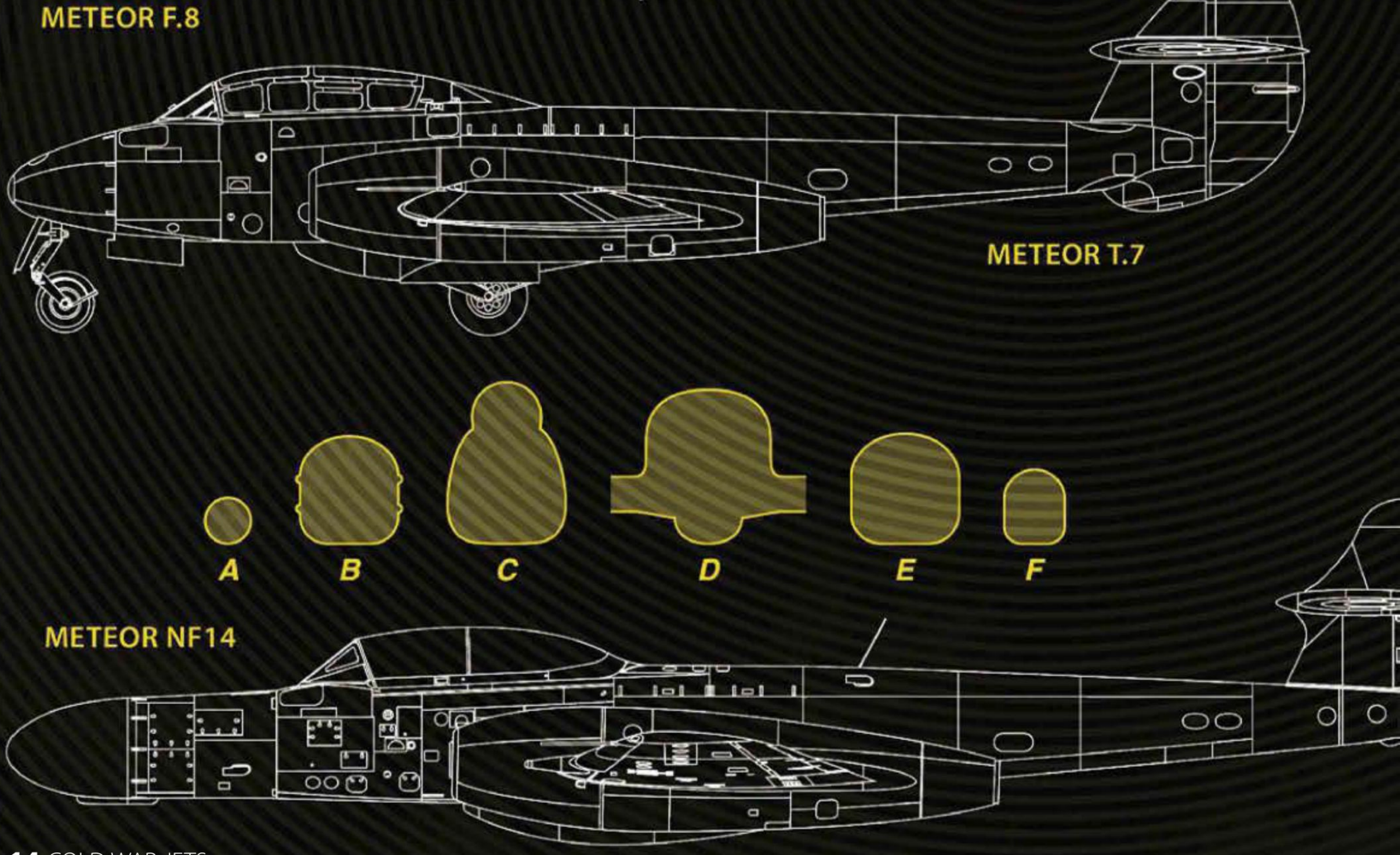

METEOR F.8

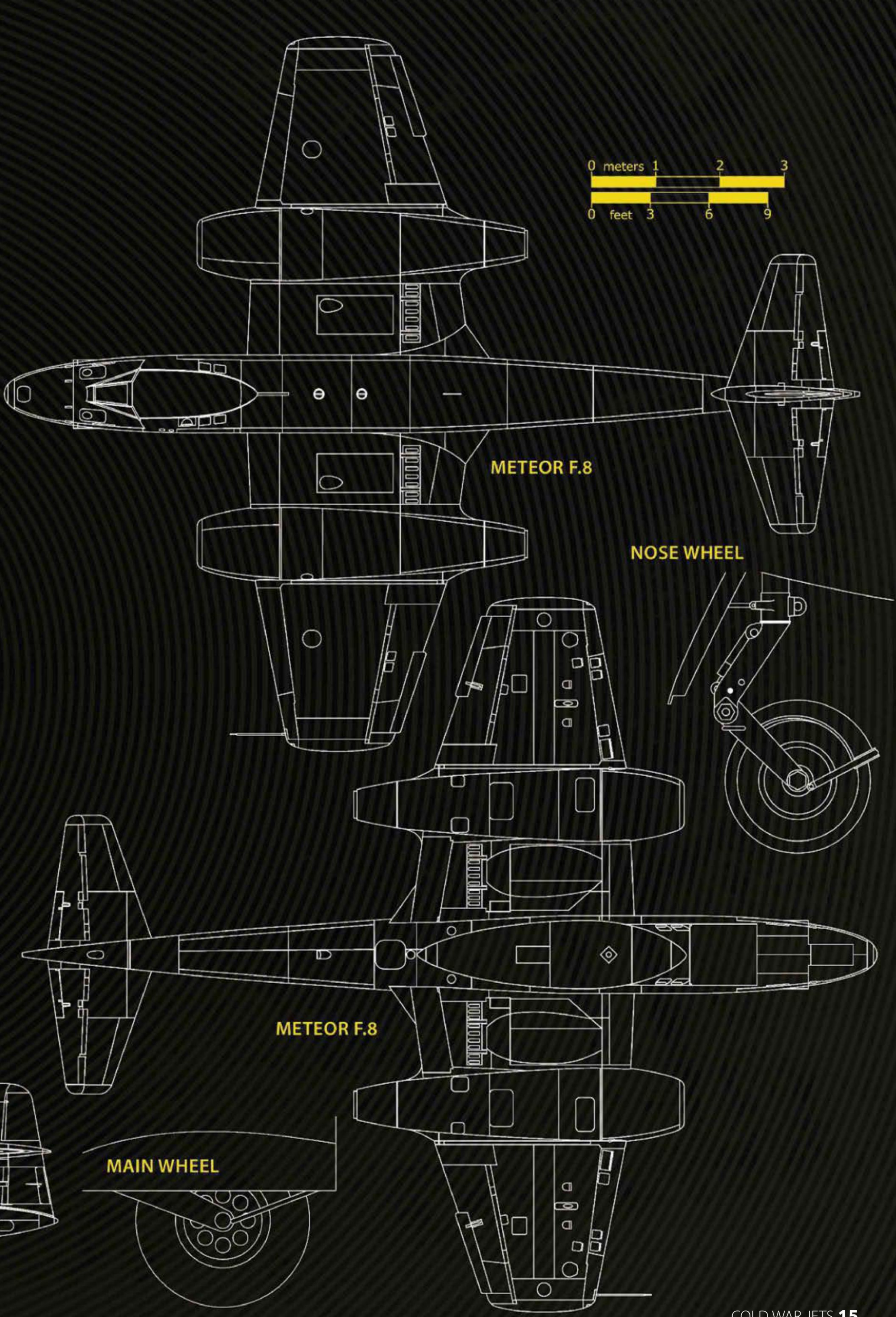


METEOR T.7




METEOR NF14




0 meters 1 2 3
0 feet 3 6 9
METEOR F.8
NOSE WHEEL
METEOR F.8
MAIN WHEEL

# DE HAVILLAND VAMPIRE

1946-1972

**Perhaps surprisingly both the first forays into operational jets by British companies can be considered outstanding successes, surpassing the expectations of the designers who were working in uncharted territory and facing the pressures of a country at war. Even thought it was designed and first flew during the war, the Vampire did not make it to front line squadrons until March 1946.**

This did not deprive the Vampire of the chance to gain its spurs with both the RAF and foreign air forces in later conflicts however. The layout of the Vampire also allowed for a straightforward conversion to jet trainer with the added advantage of allowing the instructor to sit next to the pupil. The type was navalised and was the foundation for the Venom and Sea Vixen.

Specification E.6/41 was for two prototypes of the DH 100 Spider Crab (as the aircraft was then known) and work commenced two years after the inception of the Meteor. Unlike Gloster, which had kept the fuselage design simple, de Havilland opted for a single engine mounted in the fuselage, the expected thrust generated by the Goblin being sufficient to power the fighter.

From the start the design team were considering the twin boom layout, the main advantage being a short intake and exhaust system. The design was very similar to that of the Saab J21A, a pusher fighter that Saab converted to the jet powered J21R using the Goblin 2 with minimal redesign.

Due in part to the experience gained through construction of the Mosquito the forward fuselage of the Vampire was to be a mixture of balsa and plywood, the rear fuselage and rest of the airframe were to be metal.

Early work on the Vampire was a protracted affair, the majority of the company's resources going into the DH 102 Mosquito II and DH

# DH VAMPIRE T.11 XH304

**Displayed with one of two Meteor T.7s as the RAF Vintage Pair. Involved in a fatal mid-air collision with Meteor WA669 on May 25, 1986, at RAF Mildenhall. All over Light Aircraft Grey with Yellow bands.**

**IT HAD A LONG AND VARIED SERVICE LIFE AROUND THE GLOBE AND WAS AN ESSENTIAL AIRCRAFT DURING THE EARLY YEARS OF THE COLD WAR**

103 Hornet. Despite this Geoffrey de Havilland junior was at the controls when Spider Crab LZ548 took the official first flight from Hatfield on September 20, 1943. Some minor issues became apparent during the 30 minute flight but these were not insurmountable.

With the threat of the Me 262 becoming apparent and continued delays at Gloster, the third prototype MP838 was delivered to Farnborough for testing and evaluation in March 1944. It soon became apparent that the Spider Crab was going to be a success and an order for 120 was placed by the Air Ministry on May 13, 1944. The most visible change to the aircraft was a reduction in height of the tail, the top being squared off. The tail shape reverted to a more familiar de Havilland silhouette with the FB.5.

247 (China British) Squadron was the first to convert to the Vampire (as it was now known) during March and April of 1946.

As with the Meteor, no trainer jets existed so pilots had to convert from the Hawker Tempest with no prior experience of the speeds and differences in acceleration that the Goblin provided. By the autumn, 54 Sqn and 130 Sqn were also operational Vampire squadrons, both with the F.1

The F.1 may have been a well designed aeroplane but it also had limitations, so work commenced on the F.2 and F.3. The F.2 never entered service but instead was used to explore the use of the Nene engine in the Vampire airframe, the aircraft involved were TG276, TG280 and TX807. The F.3 however was built in significant

# DH VAMPIRE

**A NAVALISED VERSION OF THE VAMPIRE WAS PRODUCED AS WERE SEVERAL EXPORT VARIANTS**

numbers and served with several frontline squadrons.

A number of improvements were made but the biggest was the increase in fuel capacity and range. Vampires were already configured to carry slipper tanks similar to the Mosquito but the internal capacity jumped from 202 gallons to 330 gallons. The F.3 also received a revised tail in a similar style to the original Spider Crab but with a smaller surface area. The changes also meant that orders for the F.1 were superseded with F.3s (a total of 138 being built). 54 Sqn was the first to replace the F.1 when they received the new type in April 1948. Its tenure with the RAF may have been short but many F.3s saw long careers with overseas air forces.

With the Meteor becoming the interceptor of choice, the role of the Vampire was to evolve with next iteration of the type. As the Tempests began showing their age, a replacement ground-attack aircraft was required. To pre-empt this, de Havilland had produced a report on the suitability of the Vampire for the role in December 1946. Having not been initially developed for low-level combat, it was anticipated that there would be some shortcomings in the FB.4, but de Havilland decided to go ahead with it.

To deal with the increased loadings created by underslung ordinance, the wing was strengthened and provision for extra hardpoints was made. There were several issues and delays with the development so orders from both the RAF and the French were cancelled.

The RAF still required a Tempest replacement however, so the FB.5 carried on where the FB.4 left off but the new specification called for an ejector seat. Due to the limited size of the cockpit this was to prove too problematic at the time and was omitted from the FB.5. With over 900 being built, the FB.5

## DH VAMPIRE FB3 VF335

**Finished in all over Aluminium and wearing unusual post-war roundels and fin flash when first delivered to the RAF in June 1947, Vampire F.3 VF335 soon received more conventional markings and seved with 54 Sqn, 604 Sqn and 602 Sqn. Having only served for six years it was retired in September 1953.**

## DH VAMPIRE FB5 WB189 4 SQN

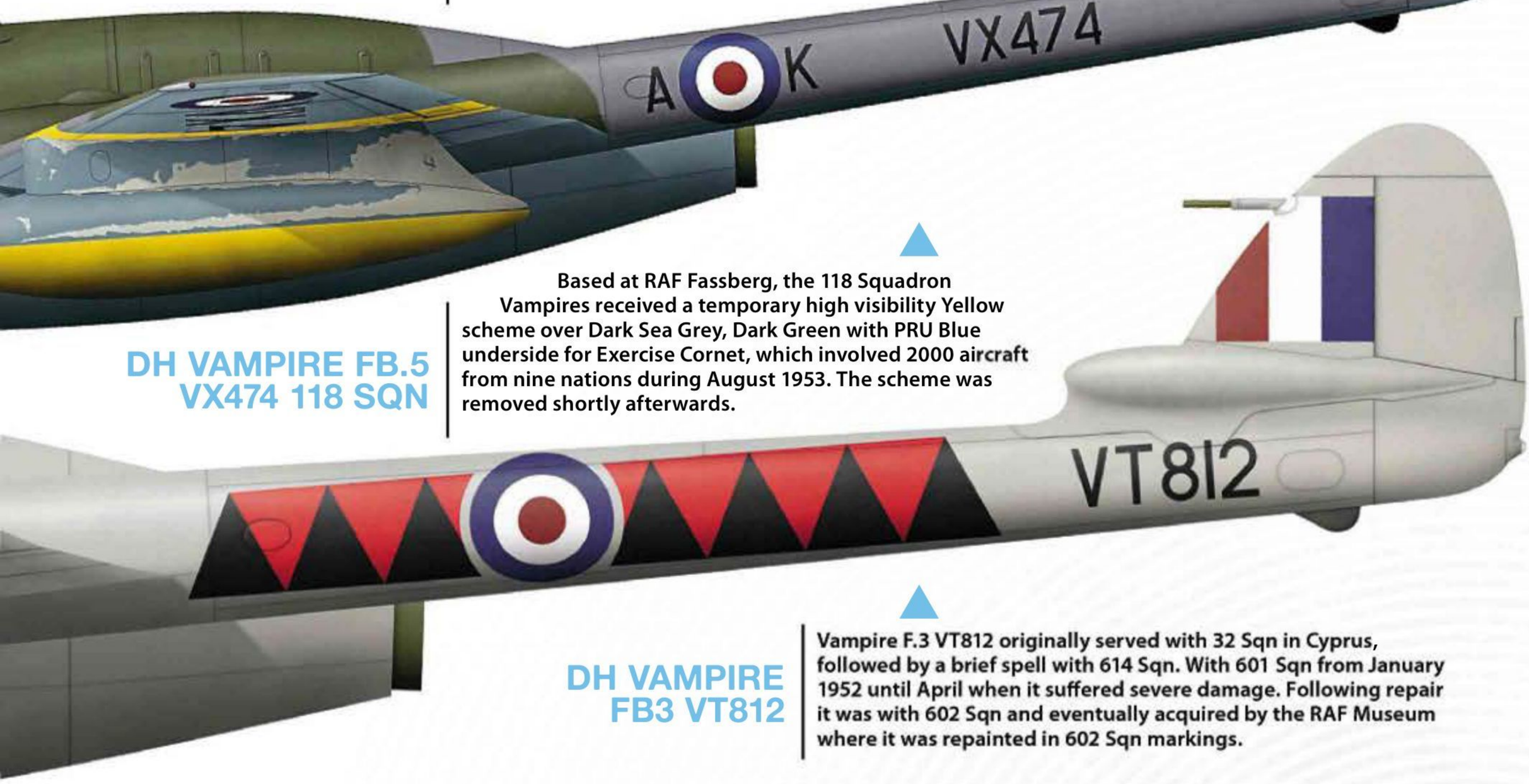
**Having flown with 92 Sqn, WB189 was allocated to 4 Sqn while at RAF Jever, Germany in October 1952 where it was flown by Fg Off E Lack in late 1952. Later it went to 226 Sqn and was struck off charge in June 1958. Thought to be painted in Ocean, Dark Green.**

## DH VAMPIRE FB.5 VZ233 73 SQN

**73 Squadron converted to the Vampire in July 1948, receiving the FB.1 which were soon replaced with later versions. The type was used until October 1954 when it was superseded by the Venom. FB.5 VZ233 was photographed in October 1950 when en route to Malta for exercises.**

## DH VAMPIRE FB.5 WA331 112 SQN

**112 Squadron's tenure with the Vampire was quite short. They re-formed at RAF Fassberg in May 1951 with the FB.5 and converted to the Sabre in January 1954. Vampires were initially in NMF with the distinctive tail but were repainted in camouflage with a sharkmouth.**




## DH VAMPIRE FB.5 VX474 118 SQN

**Based at RAF Fassberg, the 118 Squadron Vampires received a temporary high visibility Yellow scheme over Dark Sea Grey, Dark Green with PRU Blue underside for Exercise Cornet, which involved 2000 aircraft from nine nations during August 1953. The scheme was removed shortly afterwards.**

## DH VAMPIRE FB3 VT812

**Vampire F.3 VT812 originally served with 32 Sqn in Cyprus, followed by a brief spell with 614 Sqn. With 601 Sqn from January 1952 until April when it suffered severe damage. Following repair it was with 602 Sqn and eventually acquired by the RAF Museum where it was repainted in 602 Sqn markings.**

can be considered a successful variant but there were still improvements to make. With the cold war escalating, the RAF continued to build their presence in West Germany. When the FB.5s arrived they were in all over aluminium but by 1951 had been painted in camouflage.

Even though the FB.5 proved to be a very capable aircraft it still lacked some features that operations had highlighted.

Having been designed for the European theatre meant that the Vampire struggled with conditions in the Middle East. The biggest issue was the lack of air conditioning which caused several problems for the pilot. Windscreens cracked in the heat and the engine thrust was reduced in extreme temperatures.

The Goblin engine was modified to cope with the conditions and following several experiments the Godfrey Cold Air Unit was fitted, this resulted in modification to the intake and wing root on the starboard side. It was also retrofitted to many FB.5s.

Nearly 350 FB.9s were built, not as many as with earlier models but still a significant number and it went on to see active service in both Africa and the Far East, performing admirably in the ground support role for which it was intended.

# DH VAMPIRE

## DH VAMPIRE FB5 WA442 185 SQN

185 Sqn operated the Vampire for less than two years. It was re-formed at Hal-Far, Malta, on September 15, 1951, with the FB.5, following a few weeks in Cyprus the squadron was disbanded during October 1952 in Iraq.

## DH VAMPIRE FB.9 WG888 60 SQN

While involved in the Malayan Emergency, 60 Squadron received a mix of FB.5s and FB.9s in 1950, replacing the Spitfire Mk XVII, using the Vampires in the ground-attack role, such as WG888.

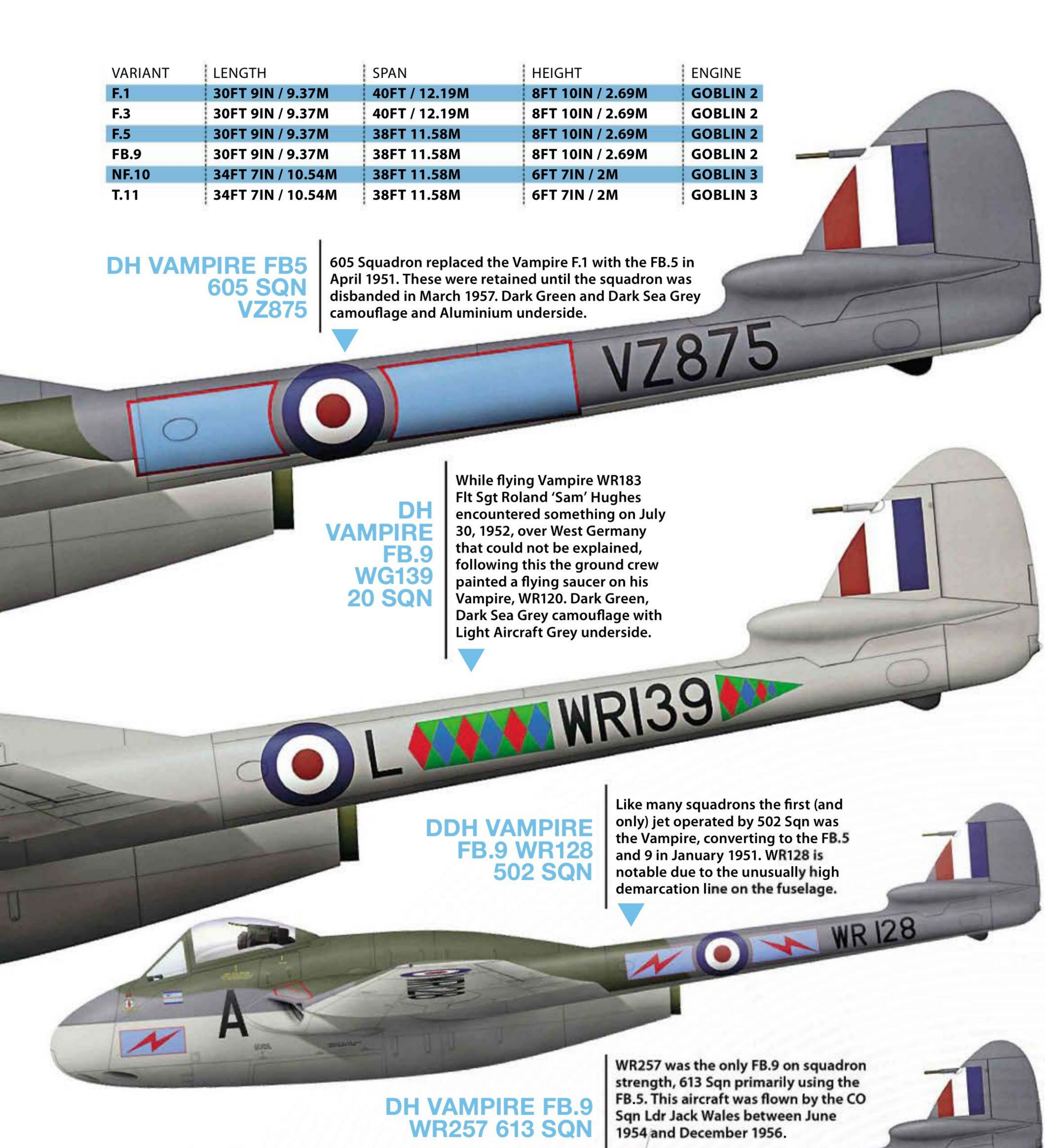
## DH VAMPIRE FB.9 WR120 213 SQN

213 Squadron was already at Deversoir, Egypt, when it received the FB.5 in 1949 but by the time of the Suez Crisis it had upgraded to the FB.9. The CO's aircraft, WR120, had a distinctive scheme with a Black nose and tail.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| F.1 | 30FT 9IN / 9.37M | 40FT / 12.19M | 8FT 10IN / 2.69M | GOBLIN 2 |
| F.3 | 30FT 9IN / 9.37M | 40FT / 12.19M | 8FT 10IN / 2.69M | GOBLIN 2 |
| F.5 | 30FT 9IN / 9.37M | 38FT 11.58M | 8FT 10IN / 2.69M | GOBLIN 2 |
| FB.9 | 30FT 9IN / 9.37M | 38FT 11.58M | 8FT 10IN / 2.69M | GOBLIN 2 |
| NF.10 | 34FT 7IN / 10.54M | 38FT 11.58M | 6FT 7IN / 2M | GOBLIN 3 |
| T.11 | 34FT 7IN / 10.54M | 38FT 11.58M | 6FT 7IN / 2M | GOBLIN 3 |

## DH VAMPIRE FB5 605 SQN VZ875

605 Squadron replaced the Vampire F.1 with the FB.5 in April 1951. These were retained until the squadron was disbanded in March 1957. Dark Green and Dark Sea Grey camouflage and Aluminium underside.




## DH VAMPIRE FB.9 WG139 20 SQN

While flying Vampire WR183 Flt Sgt Roland 'Sam' Hughes encountered something on July 30, 1952, over West Germany that could not be explained, following this the ground crew painted a flying saucer on his Vampire, WR120. Dark Green, Dark Sea Grey camouflage with Light Aircraft Grey underside.

## DDH VAMPIRE FB.9 WR128 502 SQN

Like many squadrons the first (and only) jet operated by 502 Sqn was the Vampire, converting to the FB.5 and 9 in January 1951. WR128 is notable due to the unusually high demarcation line on the fuselage.

## DH VAMPIRE FB.9 WR257 613 SQN

WR257 was the only FB.9 on squadron strength, 613 Sqn primarily using the FB.5. This aircraft was flown by the CO Sqn Ldr Jack Wales between June 1954 and December 1956.

## DH VAMPIRE T.11 WZ518 OLDENBURG

A rare camouflaged T.11 with Dark Green, Dark Sea Grey camouflage and Aluminium undersides, WZ518 has the 14 Sqn marking on the nose and was used by RAF Oldenburg station flight.

# DH VAMPIRE

**IT WAS THE VERY FIRST OPERATIONAL JET PRODUCED BY THE ALLIES AND ALMOST 4000 WERE BUILT**

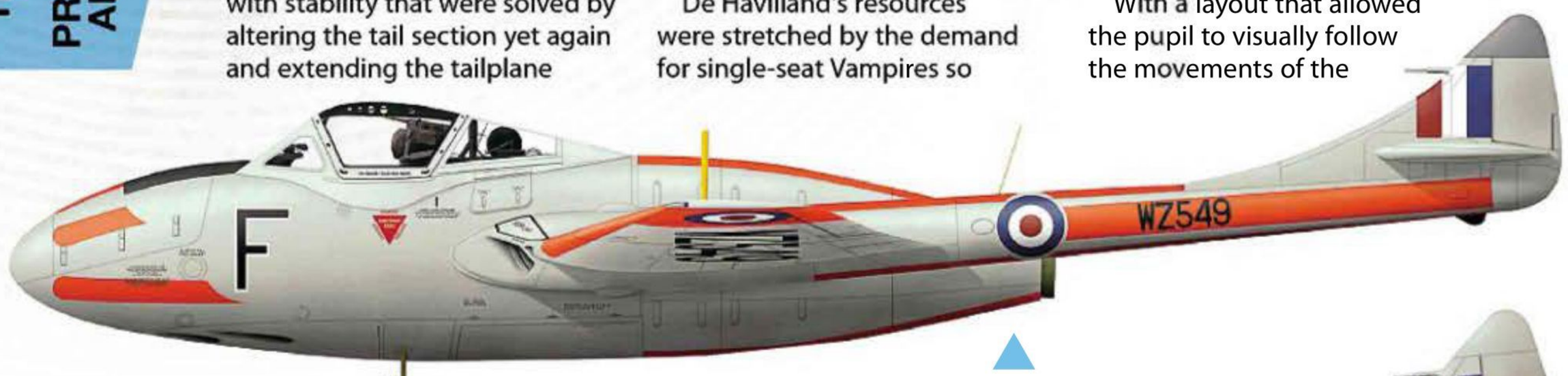
Due in part to the delays to the Meteor programme and as the result of a private initiative by de Havilland the Vampire NF.10 two-seater night fighter was created. Using knowledge gained from the Mosquito and perhaps conveniently having an almost identical fuselage diameter it was decided to position the crew side by side. The nose was extended to house the same AI Mk.10 radar that the Mosquito had used and flying controls were relocated.

The changes caused problems with stability that were solved by altering the tail section yet again and extending the tailplane beyond the booms. The height was also increased. It may have only served for a few years (July 1951 to September 1959) before being replaced by the Meteor NF.11 but it filled a temporary yet vital role.

For many pilots the Vampire was the first jet they encountered and just like the Meteor it was a steep learning curve converting to the type. Having already embarked on the two-seater NF.10, the basic layout was already in place for a Vampire trainer.

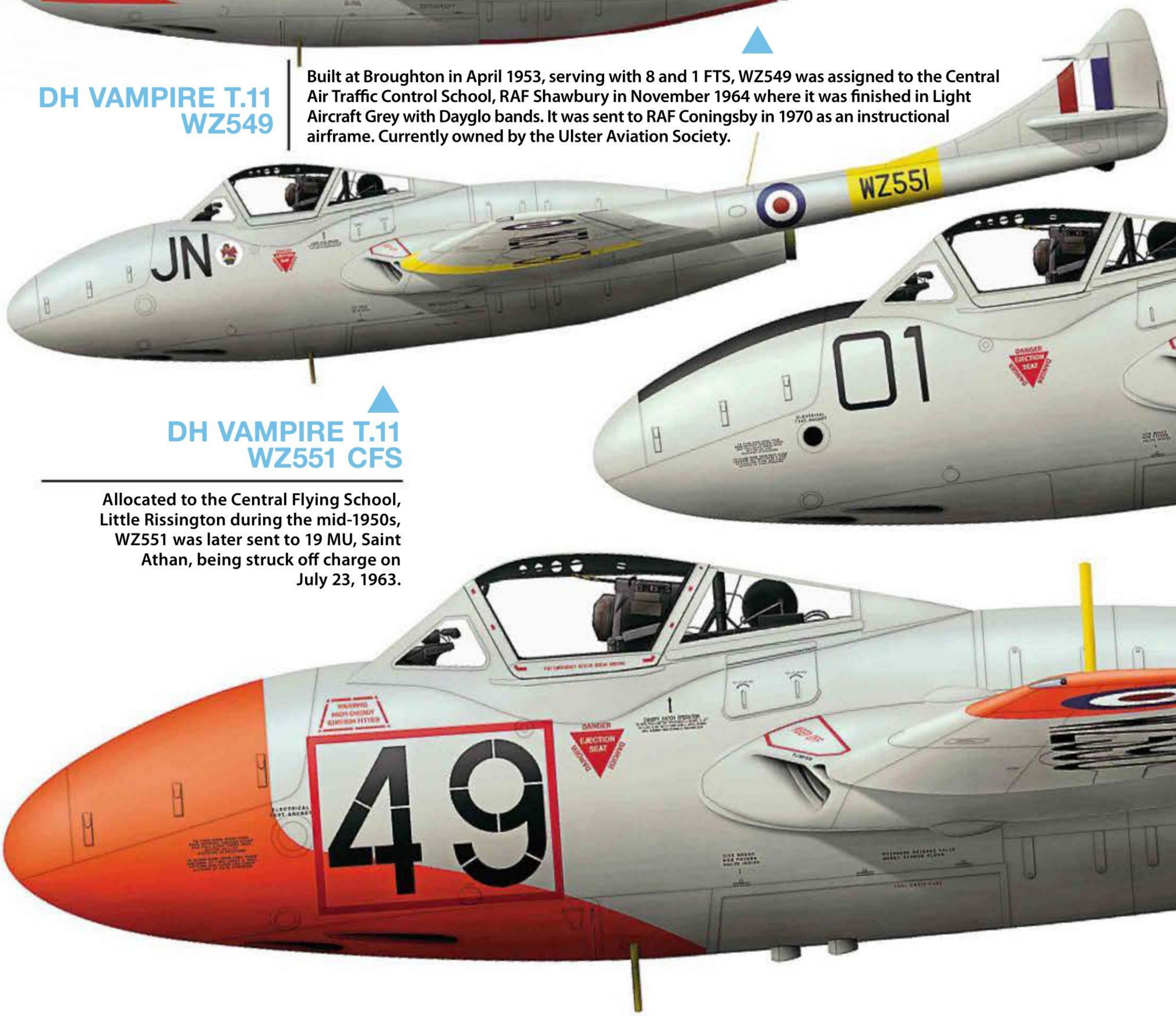
De Havilland's resources were stretched by the demand for single-seat Vampires so the job of creating the T.11 was allocated to the Airspeed company. Anticipating the need for weapons training, the basic configuration of the fighters was retained. There were some alterations to the NF.10 cockpit however, since it was rather cramped. By lowering the canopy side rails, sufficient width was created to make it possible to sit the pupil and instructor next to each other (in both the Mosquito and NF.10 they had been staggered).

With a layout that allowed the pupil to visually follow the movements of the




## DH VAMPIRE T.11 WZ549

**Built at Broughton in April 1953, serving with 8 and 1 FTS, WZ549 was assigned to the Central Air Traffic Control School, RAF Shawbury in November 1964 where it was finished in Light Aircraft Grey with Dayglo bands. It was sent to RAF Coningsby in 1970 as an instructional airframe. Currently owned by the Ulster Aviation Society.**




## DH VAMPIRE T.11 WZ551 CFS

**Allocated to the Central Flying School, Little Rissington during the mid-1950s, WZ551 was later sent to 19 MU, Saint Athan, being struck off charge on July 23, 1963.**

## DH VAMPIRE T.11 WZ421 62SQN

Delivered to the RAF on September 3, 1952, and operated by 62 Squadron between 1957 and 1959, T.11 WZ421 was sold for scrap in June 1960.

## DH VAMPIRE T.11 XE950 56SQN

Entering service on April 13, 1955, and displayed in 56 Squadron markings, T.11 XE950 is currently owned by Ailes Anciennes Toulouse museum, France.

## DH VAMPIRE T.11 XE982

XE982 was damaged beyond repair when WL505 taxied into it on the dispersal at RAF Cranwell. WL505 was only slightly damaged. Last reported to be in storage at Weston Airport, County Kildare, Ireland.

## DH VAMPIRE T11 WZ590 5 FLYING TRAINING SCHOOL

T.11 WZ590 was delivered in November 1953. Between November 1959 and March 1962 it served with No.5 FTS, RAF Oakington, before being transferred to No.8 FTS at RAF Swinderby. Subsequently acquired by the Imperial War Museum in 1973.

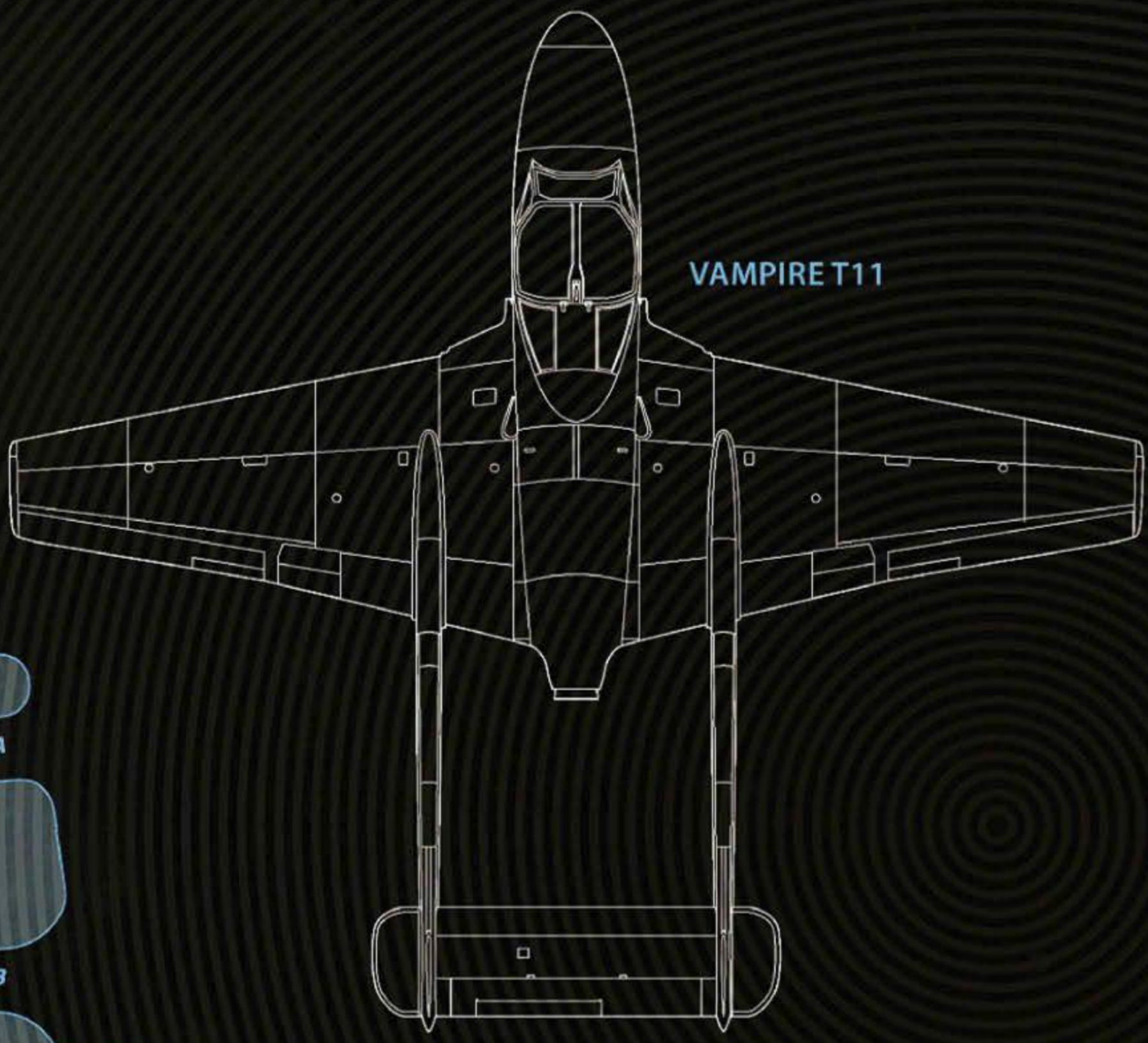
instructor, the Vampire can be considered a more practical layout than the Meteor T.7 and this arrangement was repeated in later trainers such as the Hunter and Lightning.

The Vampire T.11 had a long career with the CFS and most front line squadrons had at least one on strength to be used for instrument ratings, ongoing training and as the squadron hack.

A navalised version the Vampire was produced as were several export variants, some being constructed by overseas companies. The Vampire was yet another first generation jet that had a long and varied service life around the globe and was an essential aircraft during the early years of the cold war.

# DE HAVILLAND VAMPIRE

## PLANS: 1946 - 1972



VAMPIRE T11

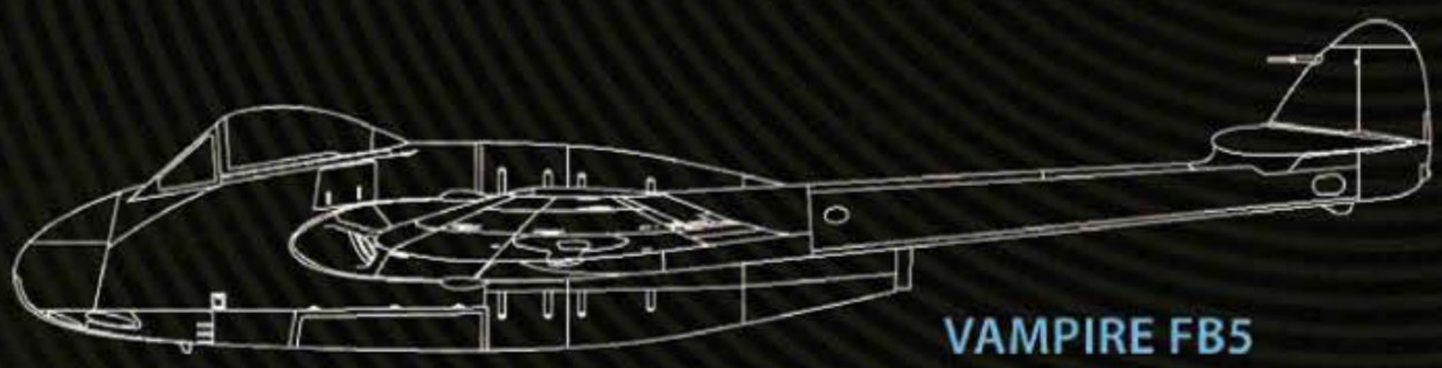
A

B

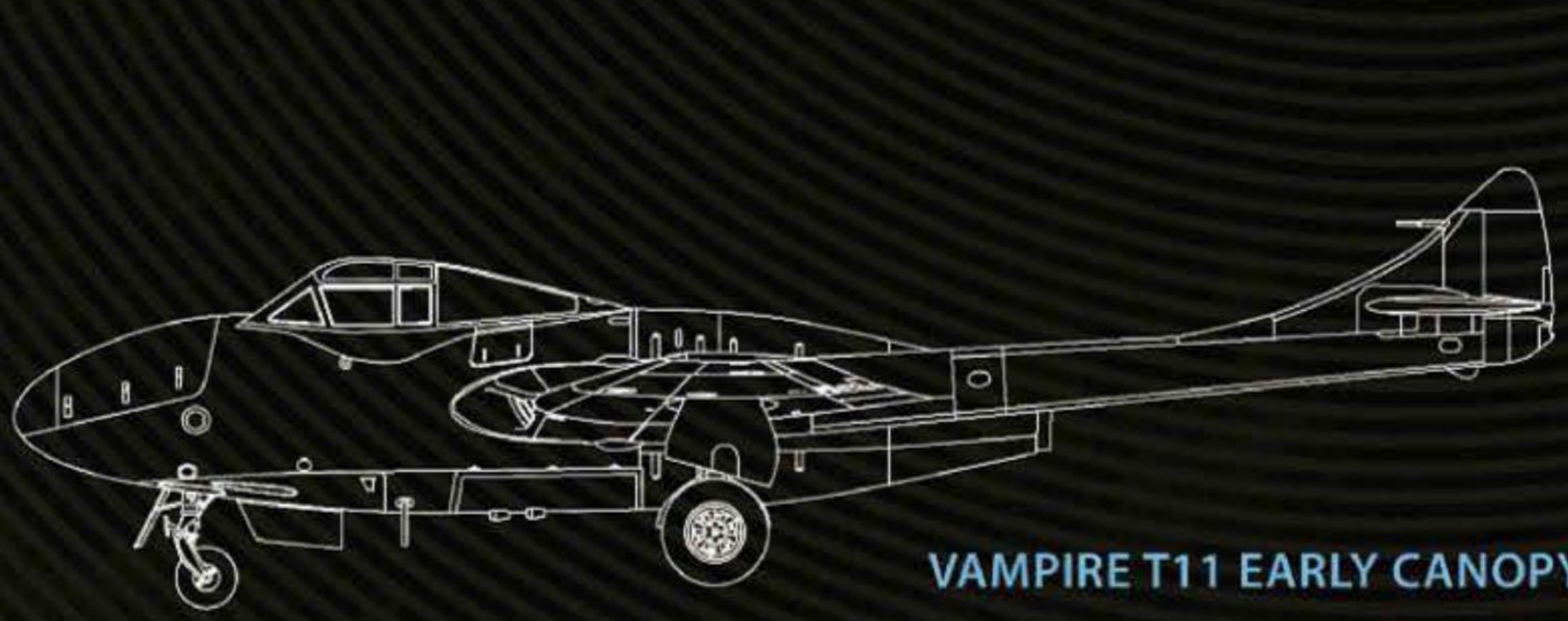
C

D

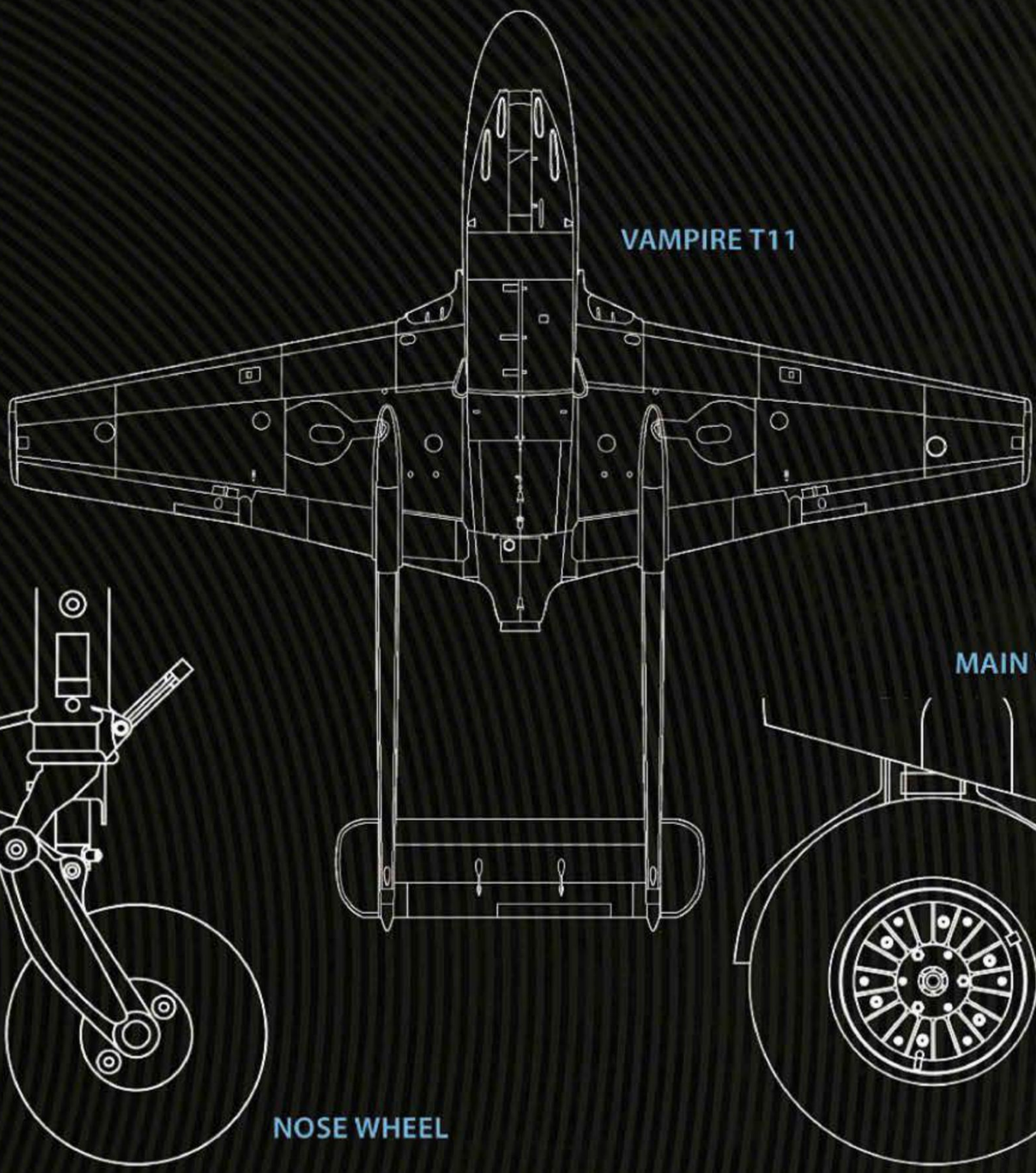
E



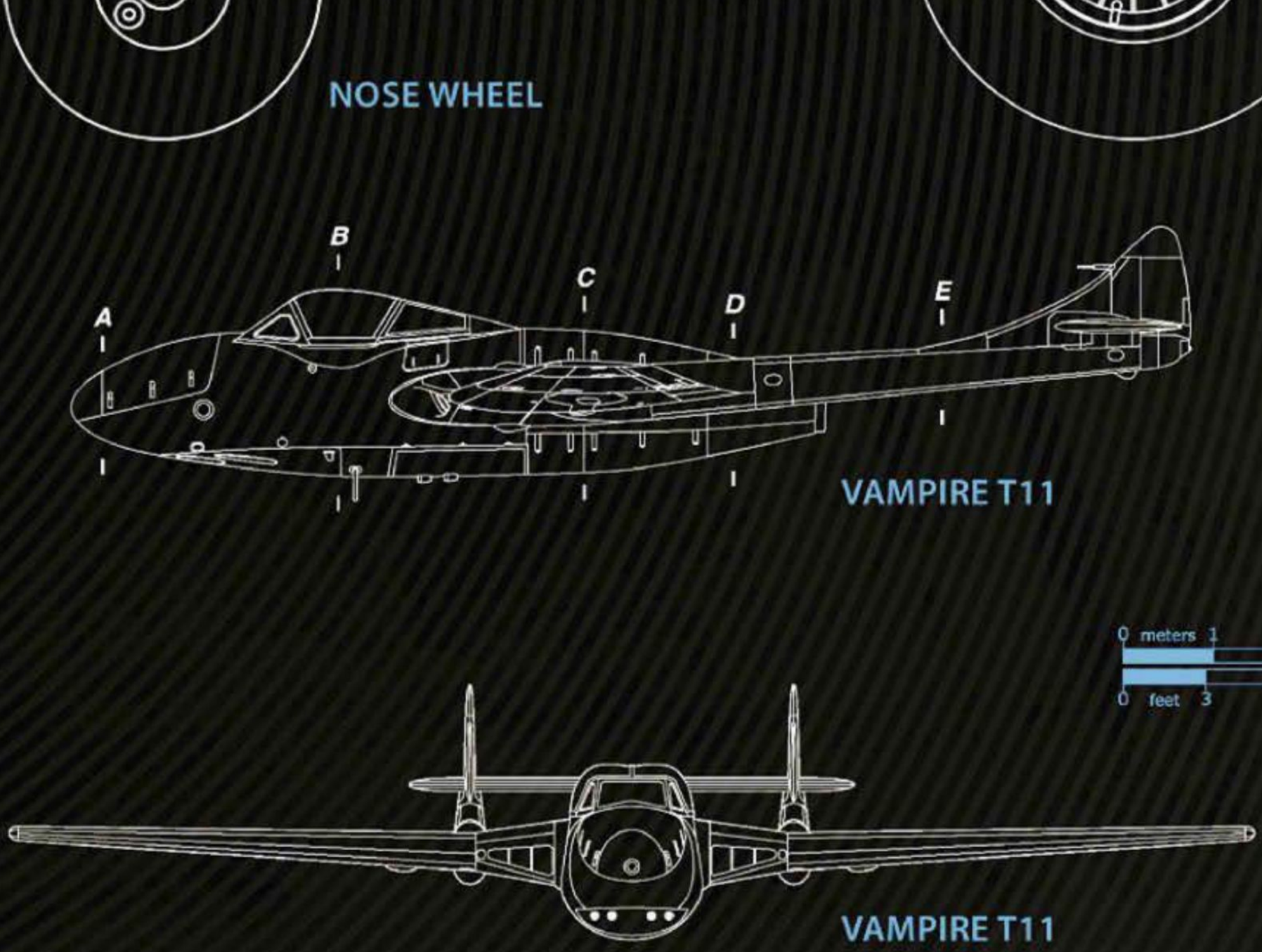
VAMPIRE FB5



VAMPIRE T11 EARLY CANOPY


VAMPIRE T11
MAIN WHEEL
NOSE WHEEL


A
B
C
D
E
VAMPIRE T11


0 meters 1 2 3
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VAMPIRE T11

# DE HAVILLAND VENOM

1949-1967

**To the uninitiated the Venom is just a souped-up derivative of the Vampire and an aircraft used to fill a gap while other types were in development. This may have been true with the original version but it fails to take into account the improvements and capabilities of later versions of the Venom or the admiration and affection in which it is held by the pilots and crew who worked on it.**

For the RAF the Venom was one of a myriad of aircraft received and flown during the postwar years and its reputation has certainly been overshadowed by others, however it had a very long and successful career with the Fleet Air Arm.

A key factor that contributed to the birth of the Venom was its power plant. The Vampire was powered by the Goblin which delivered up to 3500lb of thrust, but research suggested that alterations and scaling up could increase this significantly. The new engine, named the Ghost, could produce 5000lb of thrust, a significant improvement on the original. It was intended to install the engine in a modified Vampire and de Havilland issued a proposal outlining the replacement of the Vampire fighters with the more powerful version.

The Vampire F.8 (as it was initially named) would have a thinner wing and the fuselage was lengthened to accommodate the engine. The fuselage section would remain wooden, like that of the earlier Vampires, making it the last RAF fighter to be built in such a way.

Early in 1949 two FB.5 airframes were removed from the production line at Preston and allocated to the F.8 programme. The two airframes, VV612 and VV613 were delivered to the Hatfield factory in February 1949 and work commenced on their conversion. Work continued over the summer during which time development of the Ghost continued, the engine being tested in a converted Avro Lancastrian test bed.

By September work on VV612 had been completed and on September 2 it took to the air for the first time with John Derry at the controls. It was only four days later that the aircraft put in an appearance at the SBAC show at Farnborough.

Following Derry's display, Specification F.15/49 was issued, having been written specifically for the thin wing Vampire. Further to the proposed improvements to the FB.5, the addition of wingtip tanks was called for to increase range and the booms were significantly strengthened. Provision was also made to carry stores under the wings. Shortly after this, the new name was revealed. It had become apparent that the F.8 would be significantly different to the FB.5/9, in effect replacing the Vampire with a new aircraft, and the decision was taken to re-designate the type as the DH.112 Venom.

Flight trials commenced soon after and continued throughout the following year, primarily being conducted by Derry and John Wilson but also by A&AEE. Handling was found to be heavier than the Vampire and the rate of roll was considered very poor. Wing fences were also required to mitigate the potential to stall during landing approaches and the tailplane was extended beyond the booms. The airbrakes were also found to have negligible effect.

The majority of these issues were resolved and the rest satisfactorily corrected, however. There was also research into using reheat which produced positive results. But the idea

**DH VENOM NF.2A WL872 219 SQN**

**In the postwar years 219 Squadron was a night fighter squadron, first with the Mosquito and later with the Meteor. In 1955 it was re-formed at RAF Driffield with the Venom but this only lasted two years before it was disbanded.**

**THE VENOM ENTERED SERVICE WITH 11 SQUADRON, BASED AT RAF WUNSTORF, WEST GERMANY, IN AUGUST 1952**

# COLD WAR JETS DE HAVILLAND VENOM

**DH VENOM FB.1**
**WE283 11 SQN**

**11 Squadron based at RAF Wunstorf, West Germany converted to the Venom in 1952. WE283 is painted in Dark Green, Dark Sea Grey camouflage with PRU Blue underside.**

**DH VENOM FB.1**
**WR354 32 SQN**

**Posted to the Middle East during the Second World War, 32 Squadron remained there until 1957 and was based at RAF Amman, Jordan, during 1955 when it operated the Vampire.**

**DH VENOM FB.1**
**WE388 118 SQN**

**Part of the Fassberg Wing, 118 Squadron Venoms had the black lightning bolt on the nose and tip tanks along with the aircraft code letter.**

**DH VENOM FB.4**
**WR496 60 SQN**

**While continuing to operate out of RAF Tengah, Singapore, most of the squadron aircraft retained standard camouflage with Black tanks. But in December 1957 the squadron's aerobatic team painted their Venoms white.**

was abandoned due to cost.

WE255 was the first production Venom FB.1 to roll off the production line and was delivered to A&AEE to confirm that the alterations had improved the handling of the aircraft. WE225 was not alone as several more of the early production aircraft were used for testing and evaluation. This revealed a weakness in the wing spar and the aircraft was limited to 6g manoeuvres – quite a hindrance when comparable aircraft were cleared to 10g. The Venom entered service with 11 Squadron, based at RAF Wunstorf, West Germany, in August 1952 and in the following months an upgrade was undertaken to strengthen the offending spars.

The 2nd Tactical Air Force in West Germany continued to be the focus of Venom deliveries, to 5 and 226 Squadrons also in 123 Wing. These were followed by deliveries to 14, 98 and 118 Squadrons in 121 Wing at RAF Fassberg, West Germany, replacing their Vampires. Finally, in 1954, the squadrons of 139 Wing converted to the Venom and by this stage the FB.4 was also being produced. The aircraft also replaced the Vampire in both the Middle East and Far East, seeing action in both theatres of

operation. However the single seat variant never saw service with a UK based squadron.

In the Middle East, 6, 8 and 249 Squadrons were involved in the Suez Crisis, the FB.4s flying 390 sorties during the period and being supported by the Sea Venoms of the Royal Navy. The missions ranged from attacking convoys to destroying gun positions. Further south and around the same time 8 Squadron based at RAF Khormaksar, Aden, had their Vampires replaced with Venoms and continued their peacekeeping duties in the region.

Venoms also found their way to the Far East to replace the Vampires operating in the region. 28 Squadron was based at RAF Kai Tak, Hong Kong, and maintained a presence in the colony. Venoms were also involved in the ongoing Malayan Emergency with 60 Squadron working with Venoms of 14 Squadron RNZAF to carry out strikes on communist guerrillas. The squadron did get some respite from operations when some of the Venoms undertook a tour of the Far East as an aerobatic team.

For the tour, the aircraft were painted all over white with red tanks and rudders. Like so many other Venom squadrons their time operating the type was rather short and added up to a total of three years for the FB.1 and a further two years with the FB.4 until they replacing their Venoms with the Meteor night fighter.

With the Vampire NF.10 already under development, de Havilland proposed to the Air Ministry a Ghost 103 powered version and despite a muted response from the Air Ministry the company went ahead with modifying a Vampire NF.10 to accept the engine and Venom wings.

The change was a straightforward affair with only minor changes to the wings required, prototype G-5-3 did retain the distinctive Vampire boom and tail but the nose was extended to accommodate the AI Mk.10 radar system. The prototype flew for the first time on August 22, 1950, from Hatfield. Official interest was only piqued when delays to the Gloster

**6, 8 AND 249 SQUADRONS WERE INVOLVED IN THE SUEZ CRISIS, THE FB.4S FLYING 390 SORTIES DURING THE PERIOD AND BEING SUPPORTED BY THE SEA VENOMS OF THE ROYAL NAVY**




**DH VENOM FB.4 WR428 8 SQN**

During the Suez Crisis, 8 Squadron flew from RAF Akrotiri, Cyprus and had the temporary bands applied. These were supposed to be yellow but due to a paint shortage on the base it was mixed with cream.

**DH VENOM FB.4 WR550 8 SQN**

Based at RAF Khormaksar, Aden, WR550 made a forced landing which wrote off the aircraft as the result of a ricochet on August 22, 1957. The pilot, Flt Lt Dave Foster, was uninjured.

**DH VENOM FB.4 WR539 28 SQN**

After 28 Squadron retired the Venom at Kai Tak, Hong Kong, WR539 remained on display for several years as the gate guardian. It has since been acquired by the de Havilland Museum.

# COLD WAR JETS DE HAVILLAND VENOM

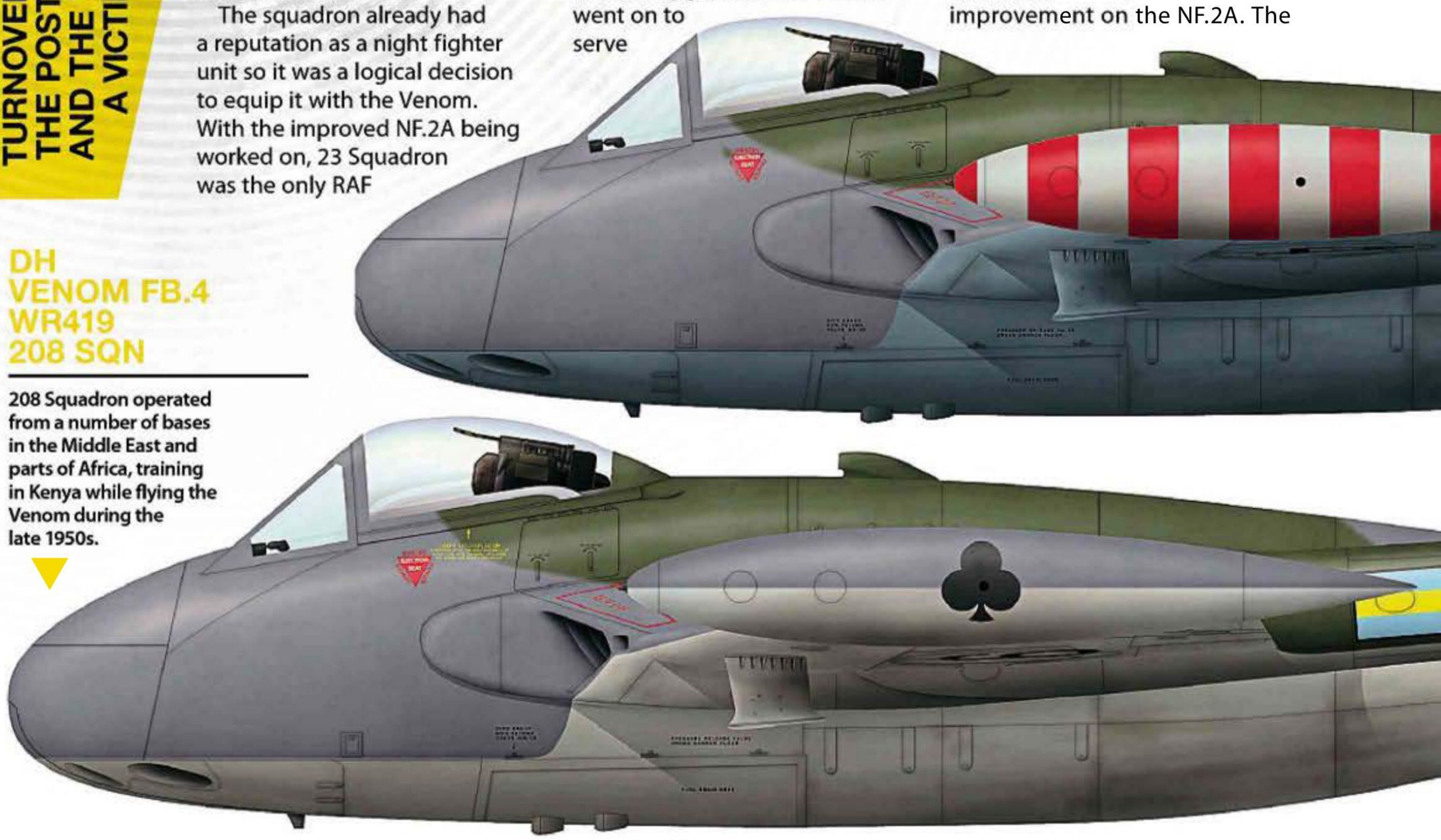
**THE RAF SAW A HIGH TURNOVER OF JETS IN THE POSTWAR YEARS AND THE VENOM WAS A VICTIM OF THIS**

Javelin became apparent and the government bought the Venom, which received the serial WP227. Just over three years after the first flight the night fighter entered service with 23 Squadron, based at RAF Coltishall when four were delivered on November 23, 1953.

The squadron already had a reputation as a night fighter unit so it was a logical decision to equip it with the Venom. With the improved NF.2A being worked on, 23 Squadron was the only RAF unit to fly the NF.2. And even they started converting to the NF.2A in August 1954.

The Venom NF.2A made a number of improvements to the basic design including a revision of the tail, improved visibility with a new canopy and minor internal upgrades. This version went on to serve with several squadrons, though just like other variants the time in service was rather short.

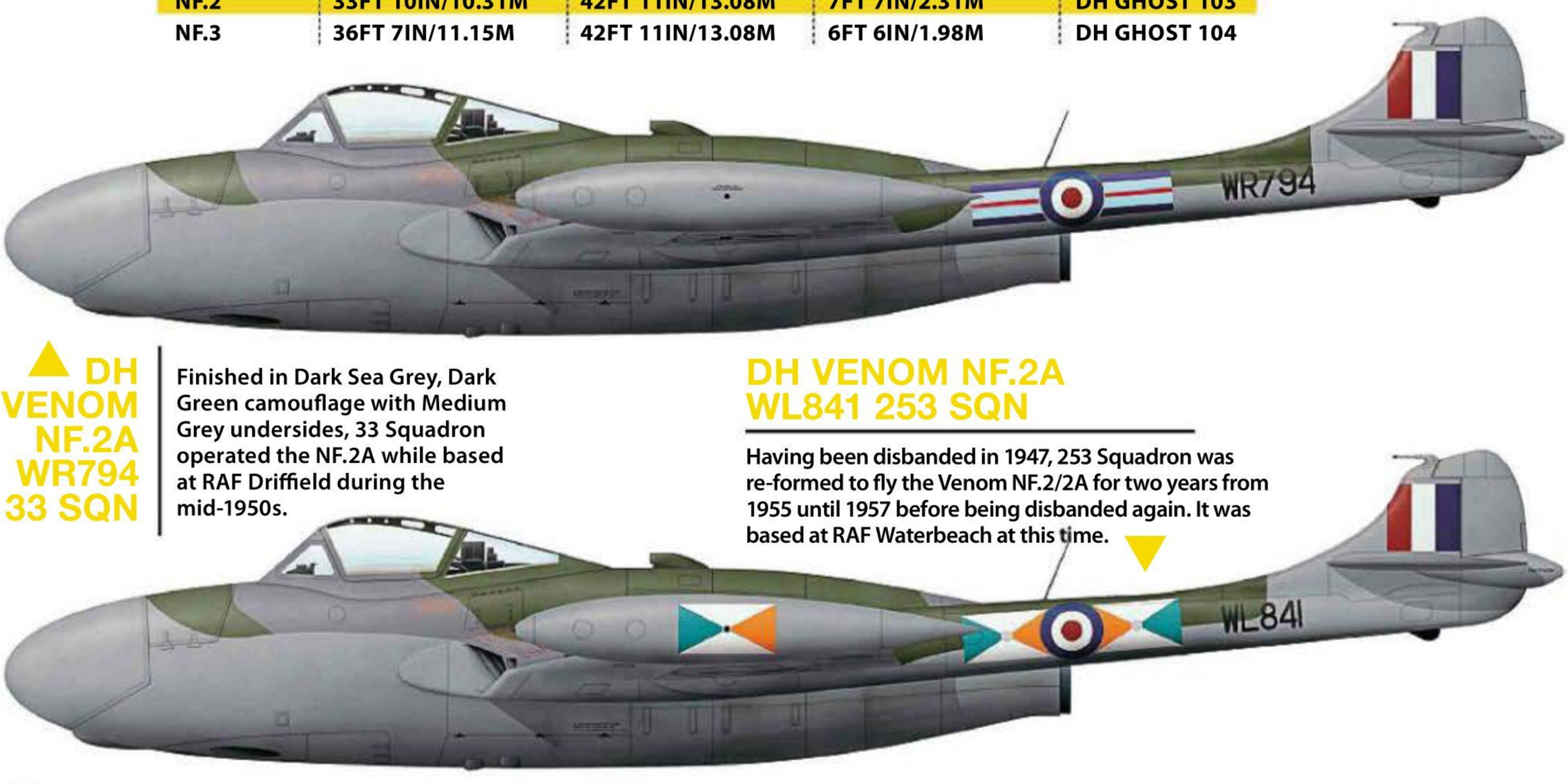
This was due in part to the introduction of the final version to be operated by the RAF, the NF.3. It was seen as a competitor to the Meteor NF.11 and was a considerable improvement on the NF.2A. The



## DH VENOM FB.4 WR419 208 SQN

208 Squadron operated from a number of bases in the Middle East and parts of Africa, training in Kenya while flying the Venom during the late 1950s.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| **FB.1** | **31FT 10IN/9.7M** | **41FT 8IN/12.7M** | **6FT 2IN/1.88M** | **DH GHOST 103** |
| **FB.4** | **31FT 10IN/9.7M** | **41FT 8IN/12.7M** | **6FT 2IN/1.88M** | **DH GHOST 103** |
| **NF.2** | **33FT 10IN/10.31M** | **42FT 11IN/13.08M** | **7FT 7IN/2.31M** | **DH GHOST 103** |
| **NF.3** | **36FT 7IN/11.15M** | **42FT 11IN/13.08M** | **6FT 6IN/1.98M** | **DH GHOST 104** |

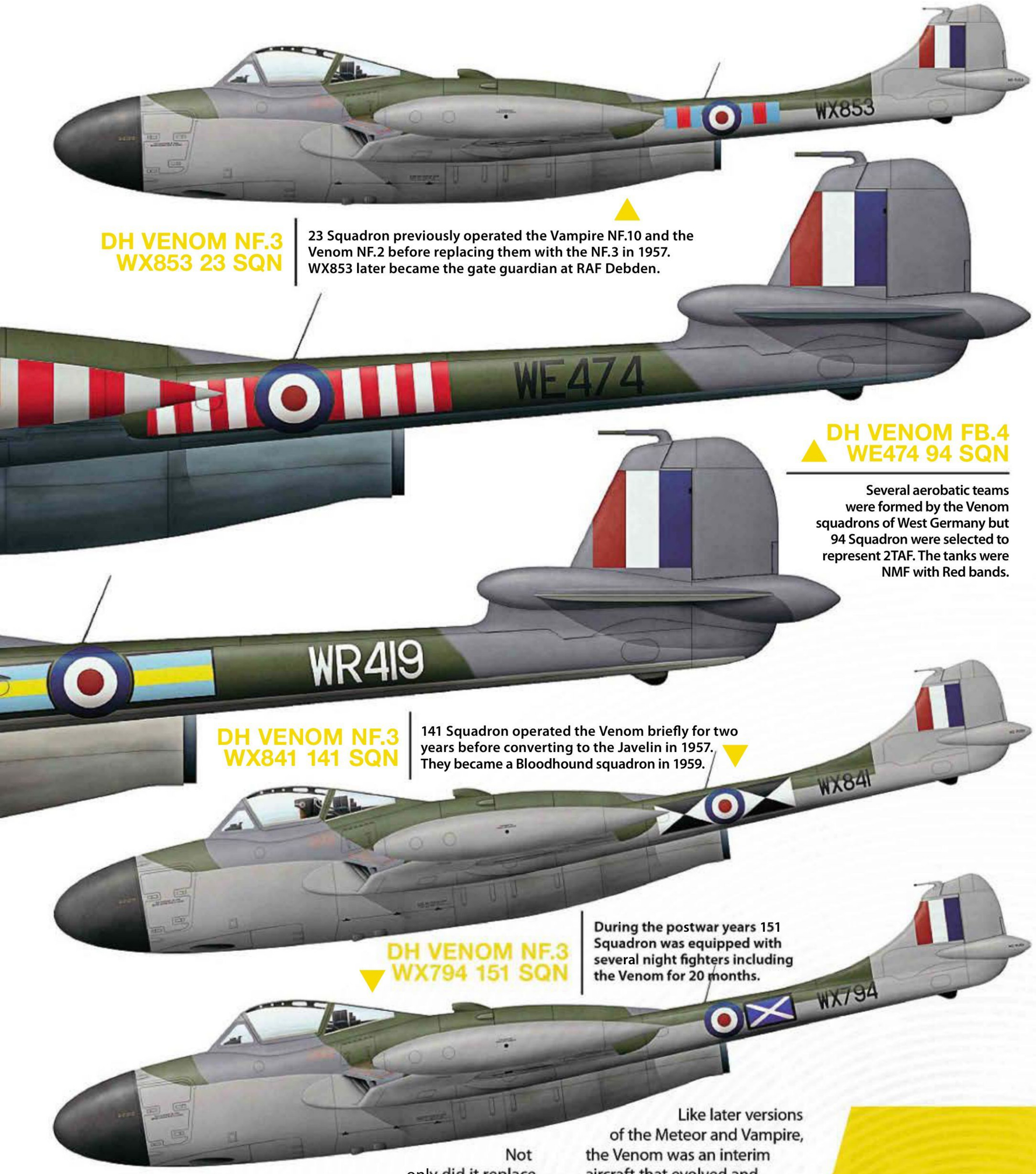



## DH VENOM NF.2A WR794 33 SQN

Finished in Dark Sea Grey, Dark Green camouflage with Medium Grey undersides, 33 Squadron operated the NF.2A while based at RAF Driffield during the mid-1950s.

## DH VENOM NF.2A WL841 253 SQN

Having been disbanded in 1947, 253 Squadron was re-formed to fly the Venom NF.2/2A for two years from 1955 until 1957 before being disbanded again. It was based at RAF Waterbeach at this time.




**DH VENOM NF.3**
**WX853 23 SQN**

23 Squadron previously operated the Vampire NF.10 and the Venom NF.2 before replacing them with the NF.3 in 1957. WX853 later became the gate guardian at RAF Debden.

**DH VENOM FB.4**
**WE474 94 SQN**

Several aerobatic teams were formed by the Venom squadrons of West Germany but 94 Squadron were selected to represent 2TAF. The tanks were NMF with Red bands.

**DH VENOM NF.3**
**WX841 141 SQN**

141 Squadron operated the Venom briefly for two years before converting to the Javelin in 1957. They became a Bloodhound squadron in 1959.

**DH VENOM NF.3**
**WX794 151 SQN**

During the postwar years 151 Squadron was equipped with several night fighters including the Venom for 20 months.

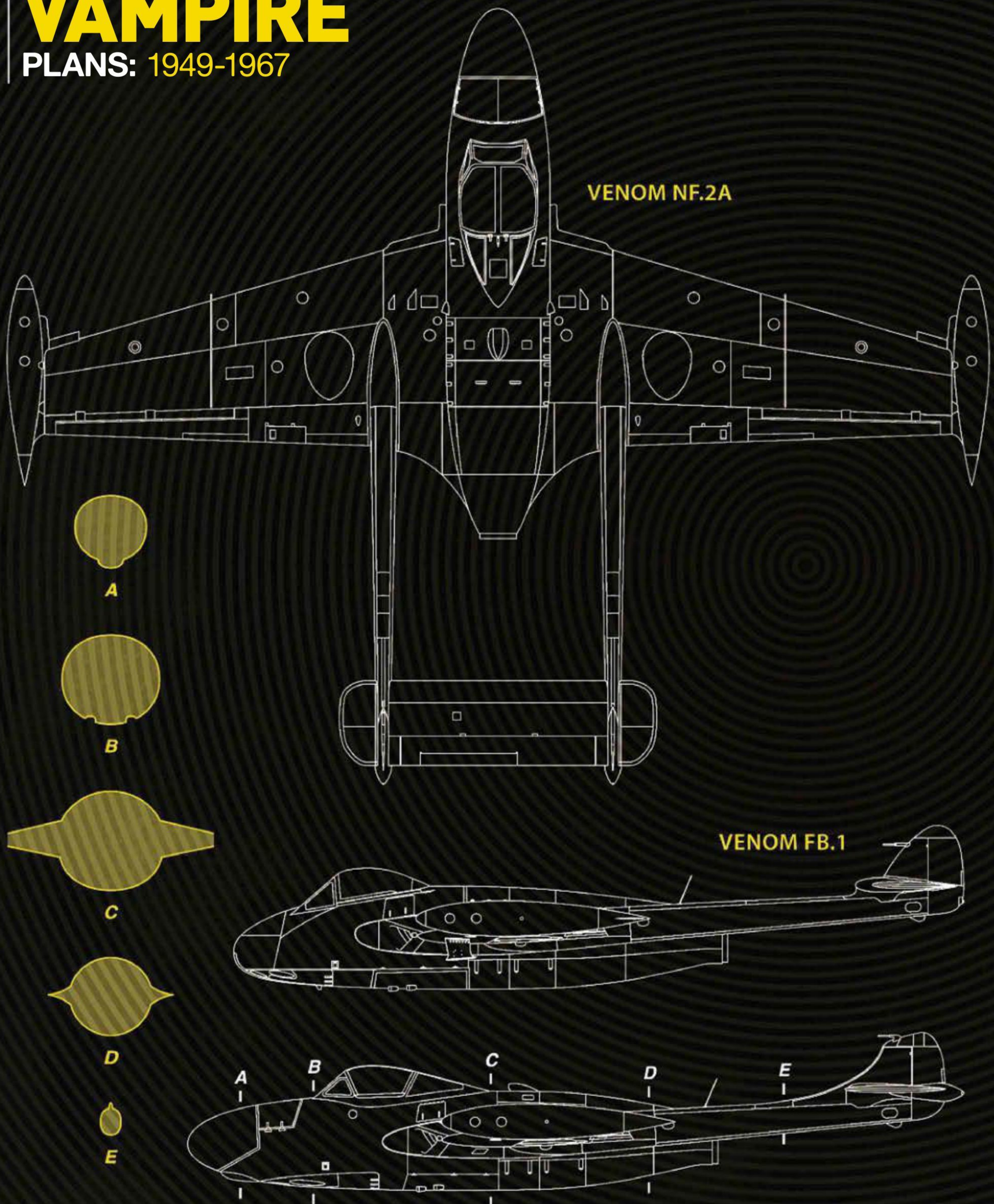
Ghost 104 was capable of producing 4950lb of thrust and the AI Mk.21 had double the range of the Mk.10, reaching up to 20 miles. The radome was also altered to allow for easier access to the equipment. Powered flying controls were introduced and further changes were made to the tail.

Not only did it replace the NF.2A with existing Venom squadrons but went on to equip yet more squadrons, a total of 129 NF.3s being built. But with newer aircraft coming into service the life of the NF.3 was just as short with some being scrapped only three years after coming off the production line.

Like later versions of the Meteor and Vampire, the Venom was an interim aircraft that evolved and adapted to new technology as it became available. The RAF saw a high turnover of jets in the postwar years and the Venom was a victim of this, but just like other de Havilland aircraft the design did find longevity in exports and with the Royal Navy in the carrier-based all weather fighter configuration.

# DE HAVILLAND VAMPIRE

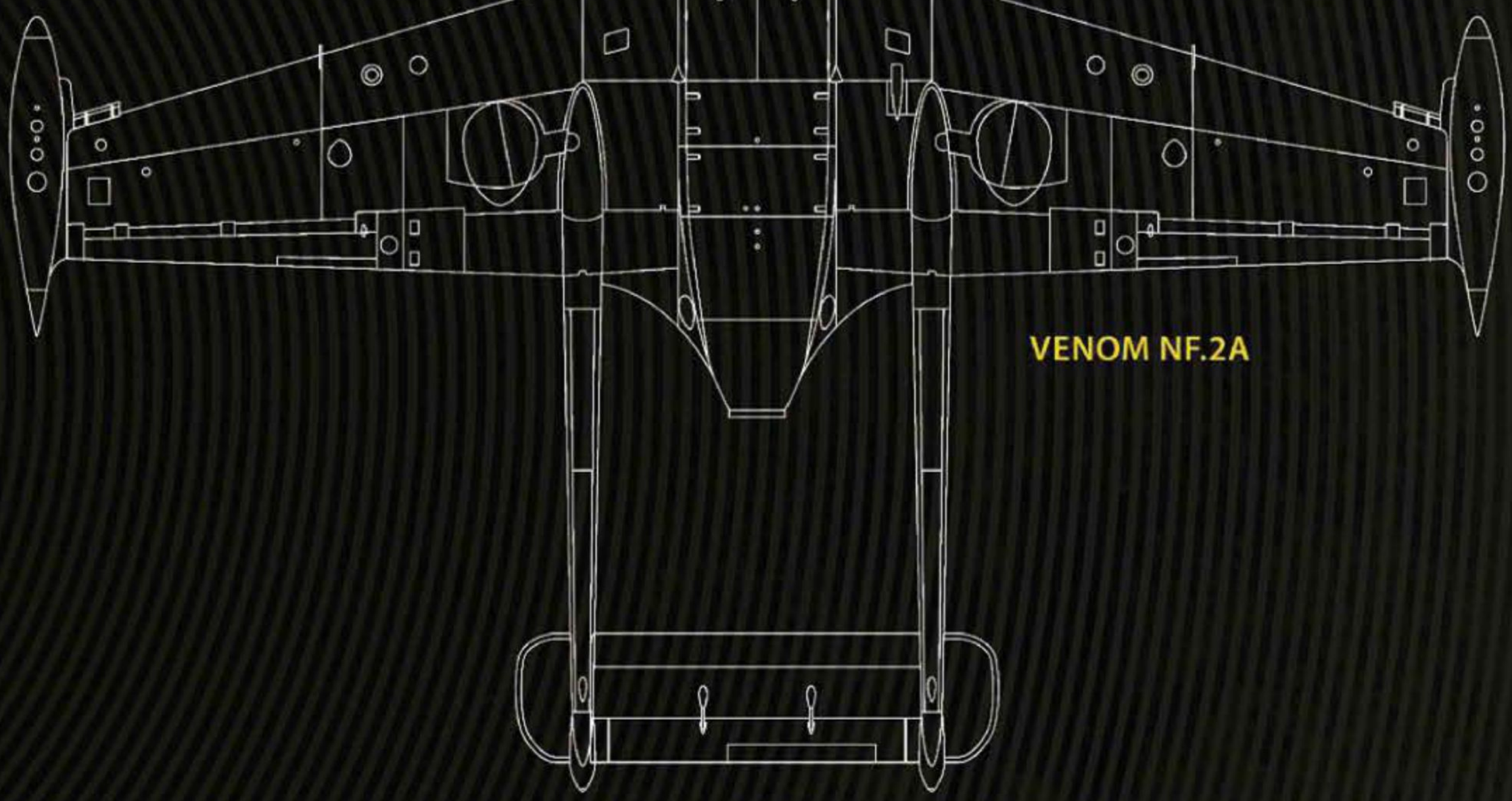
**PLANS:** 1949-1967



VENOM NF.2A

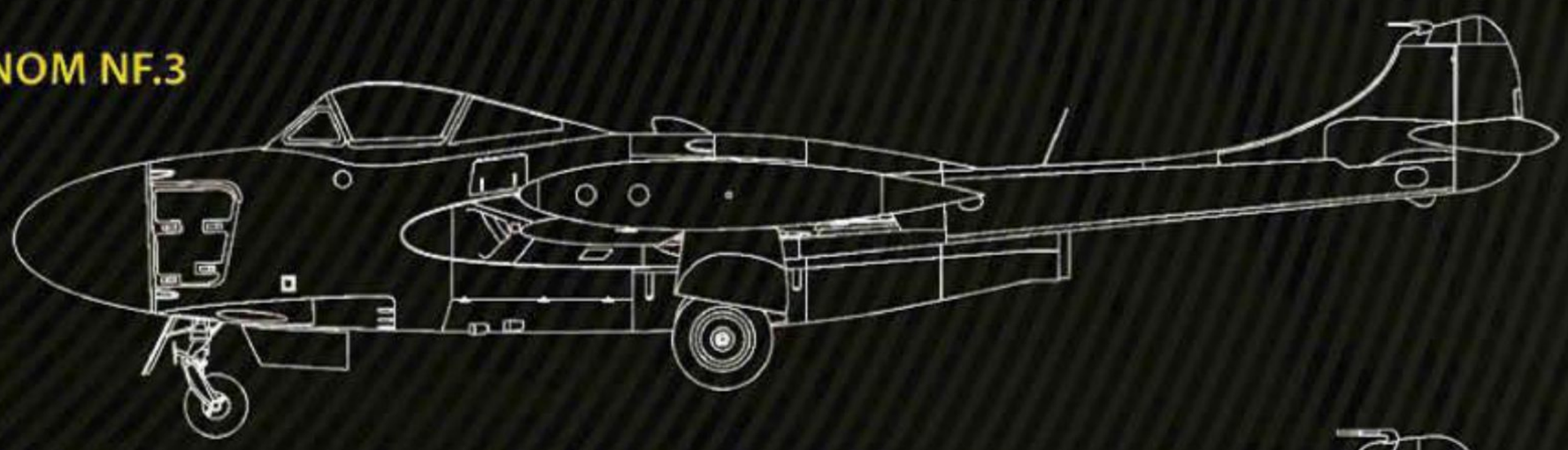
NOSE WHEEL

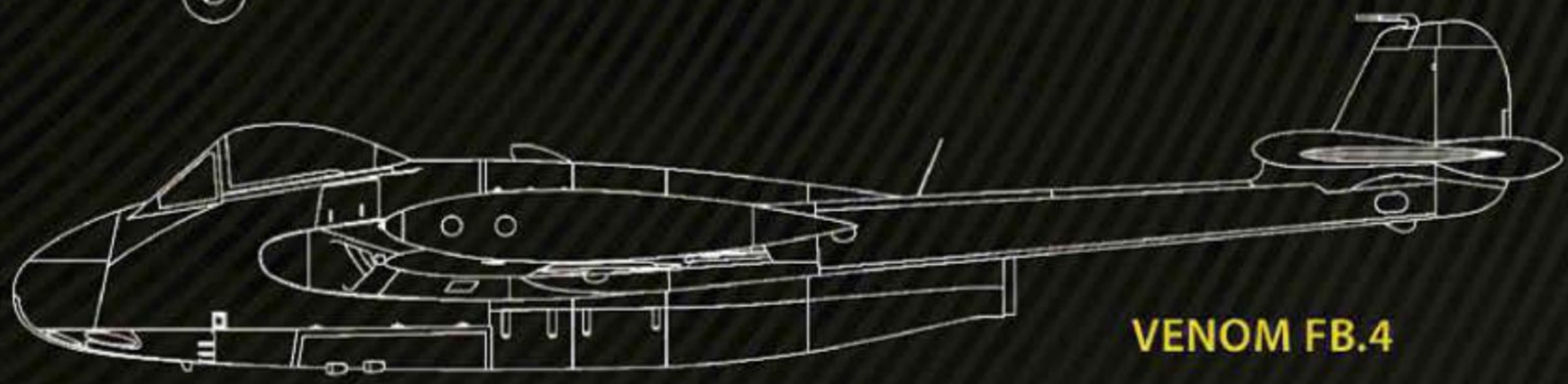
MAIN WHEEL



VENOM NF.2A

VENOM NF.3





VENOM FB.4

# ENGLISH ELECTRIC CANBERRA

1949-2006

**The Canberra's simple design and longevity make it a remarkable jet. First conceived of during the Second World War, when the Lancaster was the mainstay of Bomber Command, the Canberra was a huge leap forward in bomber technology with a much smaller crew, greater range, higher climb rate and considerably higher speed than its prop-driven predecessors. The foresight of W E W Petter and the design team at English Electric was impressive, creating an aircraft that first flew only a few years after war and carried on well into the 21st century.**

With the development of the jet engine and the success of the Meteor fighter it was apparent that a replacement for the high altitude bomber version of the Mosquito would be required. This resulted in Specification B1/44 being issued by the Air Ministry, asking for a high altitude twin-engined jet bomber which could fly at 530mph while still being manoeuvrable at low level. This piqued the interest of Westland designer Petter, who began working on concepts and gained the support of the company. The initial drawings showed an intake in the nose and the two engines in the fuselage. This was later

## ENGLISH ELECTRIC CANBERRA B(I)8 WT332 3 SQN

3 Squadron operated Canberras in West Germany for just over a decade from 1961 until replacing them with the Harrier GR.1. Finished in Dark Green, Dark Sea Grey with a Black underside.

**ENGLISH ELECTRIC WAS LEFT WITH NO COMPETITION FOR PETTER'S TWIN-ENGINED BOMBER**

changed to the wing roots and eventually the power plants would be mounted in the wings.

While Petter was away on leave, however, Westland decided to proceed with the Wyvern naval fighter rather than his bomber. This ultimately led to the designer leaving for English Electric where his ideas would be realised.

With other companies focusing on the larger bombers, which would lead to the V force, English Electric was left with no competition for Petter's twin-engined bomber and work began in 1945. Early designs had heavily swept wings, which were popular at this time, but with the thrust available from the early Rolls-Royce jet engines, compressibility was not considered an issue and a similar wing form to the Meteor was chosen.

Work progressed at a steady pace and by May 1949 the new bomber was ready for flight testing. With Wg Cdr Roland Beamont at the controls VN799 undertook several high-speed taxi runs and a first short hop on May 9, 1949. Following more hops to test flight controls, VN799 lifted off from Warton on Friday, May 13, not the most auspicious day but the flight was considered a success. The only significant changes seen were to the rudder, which was squared, and removal of the dorsal fillet.

By the September the Canberra was ready for public display and painted in a high gloss Cerulean Blue. At Farnborough it is reported to have stolen the show with Beamont putting on a stunning show every day with a variety of high and low speed passes, dramatic climbs and rolls.

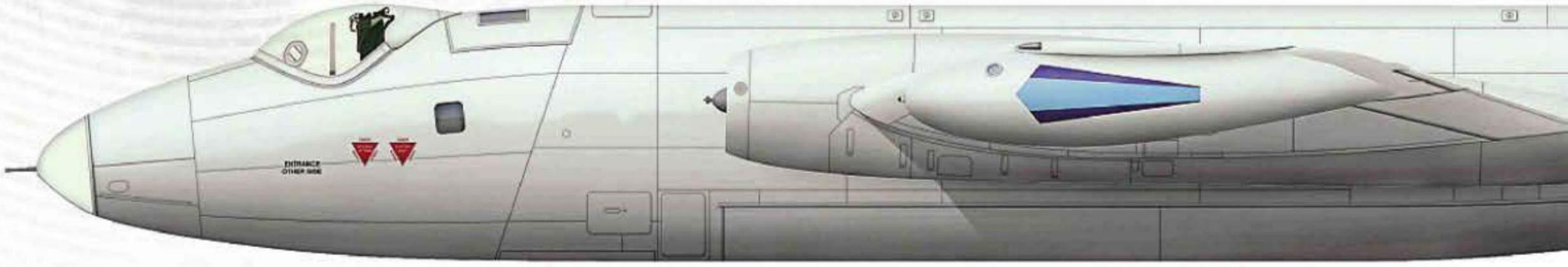
A further three prototypes (VN813, VN828 and VN850) were constructed and received the designation B.1 and used for ongoing development trials of the type.

The original intention was for the Canberra to bomb from altitude by radar, but the equipment available at the time turned out to be too bulky for the Canberra so changes had to be made to accommodate a third crew member who could undertake visual bomb aiming duties.

# ENGLISH ELECTRIC CANBERRA

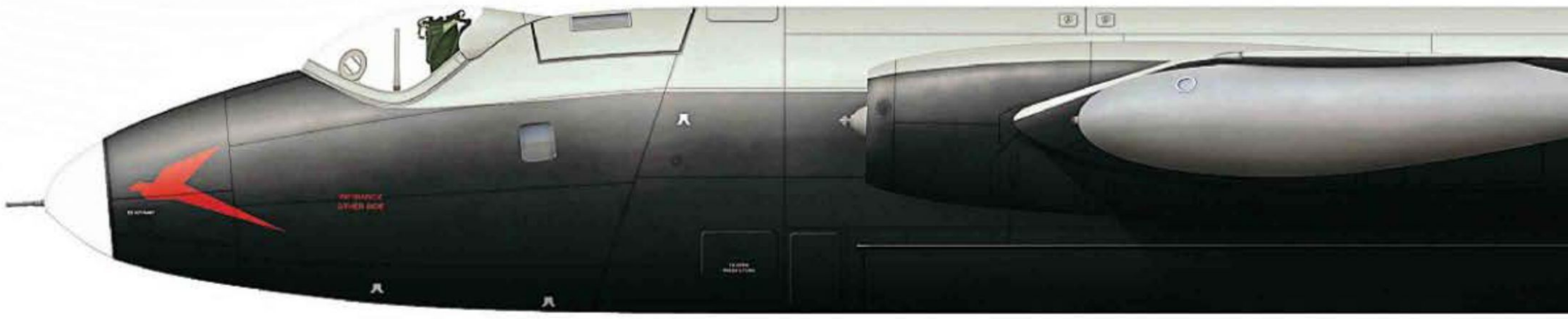
**ENGLISH ELECTRIC CANBERRA B(I)8 WT333**

Originally built as a B(I)8, WT333 had a modified B.2 nose fitted in 1972 for trials. For several years it flew with a mixed scheme before being repainted in Raspberry Ripple in 1978. Upon retirement it was delivered to Bruntingthorpe, Leicestershire, in January 1995.



**ENGLISH ELECTRIC CANBERRA B2 WD988 75 SQN**

While at El Adam in 1958 WD988 was painted in a trial all over White scheme, standard national markings and squadron on the tail.



**AS WELL AS TOURS TO THE FAR EAST AND AFRICA THERE WAS A CONSTANT CANBERRA PRESENCE IN GERMANY FOR MANY YEARS THROUGHOUT THE COLD WAR**

This necessitated a transparent nosecone with the resulting aircraft, the B.2, becoming the most successful Canberra variant. A total of 416 were delivered to the RAF commencing on May 25, 1951, with delivery of WD936 to 101 Sqn at RAF Binbrook, where it replaced the Avro Lincoln. To cope with the order, half of production was subcontracted to Avro, Handley Page and Short Brothers, helping to keep these companies active while they developed their V bombers.

The B.2 squadrons operated across the globe, detachments from several B.2 squadrons participating in the Suez Crisis. Based at Tengah, B.2s flew regular sorties against insurgents during the Malaya Emergency. As well as tours to the Far East and Africa there was a constant Canberra presence in Germany for many years throughout the Cold War and they were a regular fixture at RAF Akrotiri in Cyprus.

One derivative of the B.2 variant was the T.4. The Canberra may have had few vices but there was still a need for a dual control version due to the high numbers of B.2s entering service and the conversion of bomber pilots from piston to jet engines. Despite the cramped conditions in the nose there was no external redesign and the two seats were fitted in WM467, which first flew on June 12, 1952. Delivery to 231 OCU began in September 1953. Deliveries continued until 1955 by which time 66 had been produced. A further 17 B.2s were also converted to the T.4 configuration.

Mistakes arising from the power and acceleration of the jet engine, a common problem during the early days of conversion to jets, combined with a somewhat laid back approach to training, resulted in a number of Canberra accidents in either poor weather or at night

by pilots who had few hours on the type. With the introduction of the T.4, a revised training programme and experienced instructors who were aware of circumstances in which slightly erroneous instrument readings were given, there was a considerable reduction in accidents.

Only one B.5 was built, VX185, but it was a very successful and active aeroplane. Key changes included leading edge fuel tanks, upgraded radar, improved low level handling, Avon Mk 109 RA7 engines and a new Dunlop anti-skid braking system. During range trials it became apparent

at Warton that the ultimate trial would be to cross the Atlantic and return. The eventful double Atlantic Flight took place on August 25, 1952. Four hours and 34 minutes after leaving Aldergrove, VX185 touched down at Gander, Newfoundland. Following a service and refuelling it was time to return to the UK. The whole trip took 10 hours and three minutes, despite an extended turnaround, and became a media sensation.

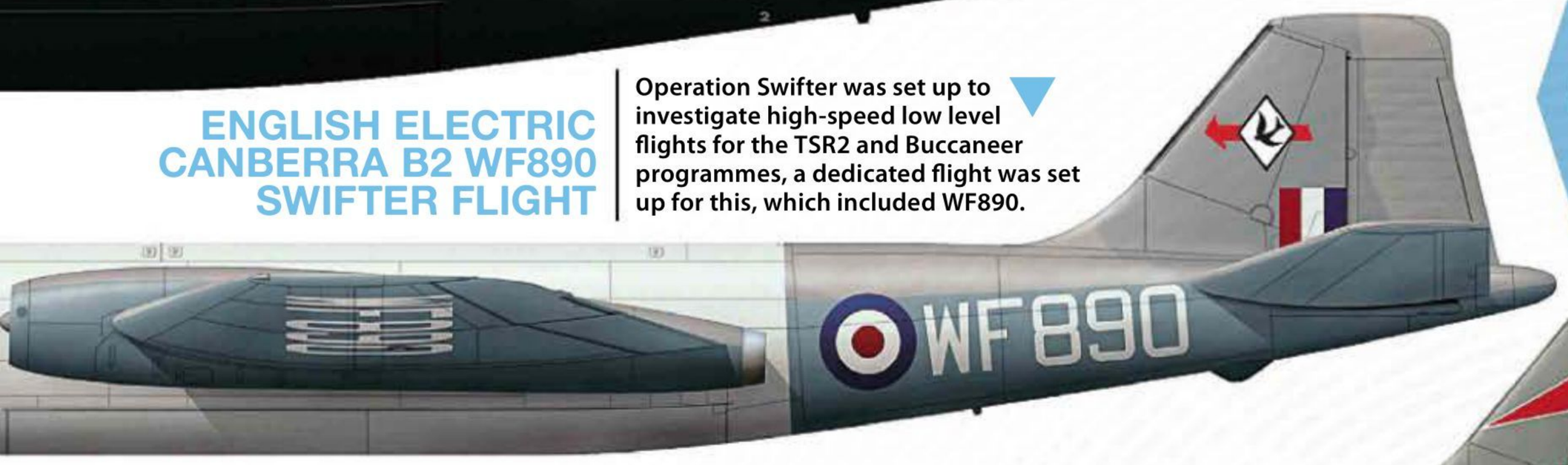
With the V bomber force yet to be fully established, the role fell to the Canberra with B.6 being developed for night interdiction, based closely on the B.2 but with the enhancements of the B.5 only 20 were built. One squadron also saw their B.6 fitted with a ventral gun pack and underwing pylons. The type's career was short-lived however, due to the introduction of the B.8.

## ENGLISH ELECTRIC CANBERRA B2 WD965 10 SQN

**Early Canberras were painted in the Medium Altitude Night Bomber scheme which consisted of Gloss Black underside and Medium Sea Grey upper surface. The 10 Squadron aircraft were later repainted in camouflage.**

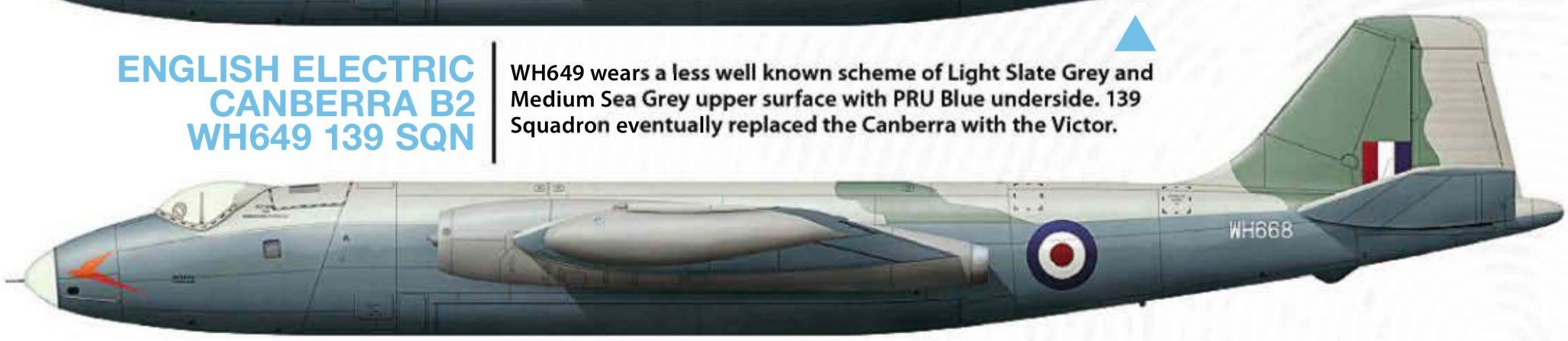
## ENGLISH ELECTRIC CANBERRA B2 WF890 SWIFTER FLIGHT

**Operation Swifter was set up to investigate high-speed low level flights for the TSR2 and Buccaneer programmes, a dedicated flight was set up for this, which included WF890.**



## ENGLISH ELECTRIC CANBERRA B2 WH649 139 SQN

**WH649 wears a less well known scheme of Light Slate Grey and Medium Sea Grey upper surface with PRU Blue underside. 139 Squadron eventually replaced the Canberra with the Victor.**




## ENGLISH ELECTRIC CANBERRA B.2 WH668 10 SQN

**WH668 has an interesting scheme with the tanks and engine pods finished in Aluminium. 10 Squadron only operated the Canberra for 4 years but during that time the aircraft were involved in the Suez Crisis.**

# ENGLISH ELECTRIC CANBERRA

**THE B.8 WAS DESIGNED WITH FLEXIBILITY IN MIND, ITS ROLES INCLUDING HIGH ALTITUDE BOMBER, LONG RANGE INTERDICTOR, NUCLEAR DELIVERY SYSTEM**

The B.8 was designed with flexibility in mind, its roles including high altitude bomber, long range interdictor, nuclear delivery system, low level operations and target marking. To achieve all this the front of the Canberra saw a significant redesign with a narrower yet raised fighter-style canopy for improved visibility. The seat for the bomb aimer/navigator was moved into the nose. Like the B6 it had provisions for a gun pack, underwing pylons that could carry a 1000lb bomb, Matra rocket launcher or 37 Sneb 2in rockets. Only 57 were built but many went on to see a second life in the export market.

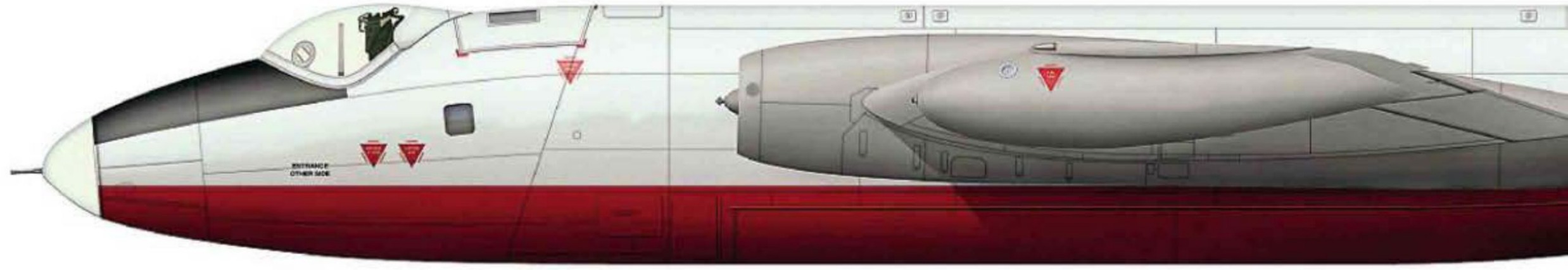
With the introduction of newer aircraft in the interdiction role the Mk.8 was the last in the line of Canberra bombers. It was not, however, the end of the Canberra.

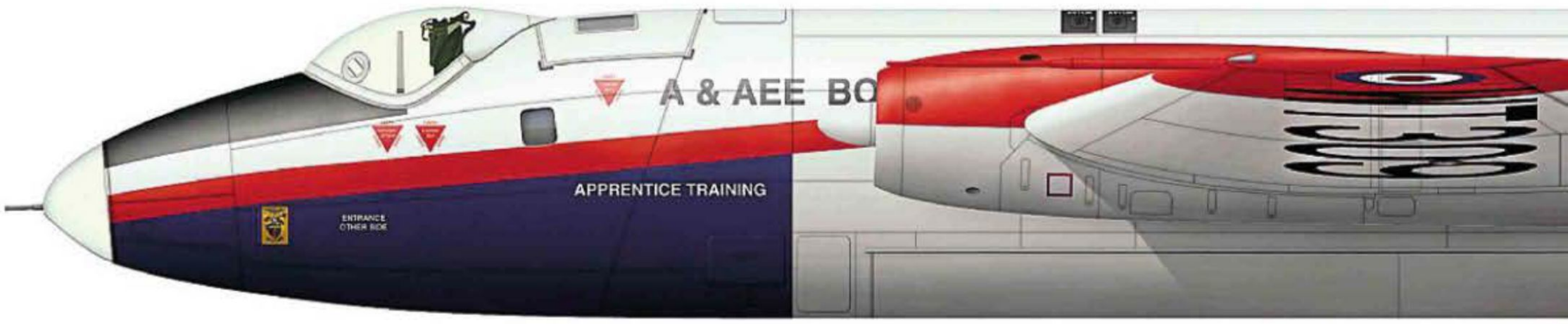
At the same time as the B.2 was being developed the Canberra was also developed for the photo reconnaissance role. Based on the B.2 fuselage the forward fuselage was extended to fit an extra fuel tank, cameras and flares. Tests of the prototype VX181 revealed extensive vibrations, not a good thing for high altitude photography. The issues were caused by a combination of the new split flaps and extended fuselage, despite increasing the weight of the tab and elevator mass balances the issue was never fully resolved with the PR.3 and only 35 were completed.

Despite the issues with the PR.3 it was still considered a success by the RAF and English Electric began work on the PR.7, utilising the new features that were introduced into the Mk.5 and Mk.6 but with a PR.3 fuselage. The improved performance evidently endeared the type to the RAF with 74

## ENGLISH ELECTRIC CANBERRA B2 WH725 50 SQN

**Based at RAF Binbrook and later RAF Upwood, 50 Squadron converted to the Canberra in August 1952. WH725 was not delivered until May 1953. It is preserved at IWM Duxford and the stripes have since been removed.**




## ENGLISH ELECTRIC CANBERRA B(I)6 WT309 A&AEE

**Unlike the other B(I)6 built, WT309 never entered squadron service. Instead it was allocated to A&AEE, Farnborough and became part of Weapons Flight. During the mid-1980s it was retired and eventually scrapped. Finished in standard Raspberry Ripple.**

## ENGLISH ELECTRIC CANBERRA B2 WJ567 85 SQN

**Having had a colourful career, WJ567 was used as a target by 85 Squadron and painted in Light Aircraft Grey with Day Glo bands during 1974.**

## ENGLISH ELECTRIC CANBERRA B2 WJ611 101 SQN

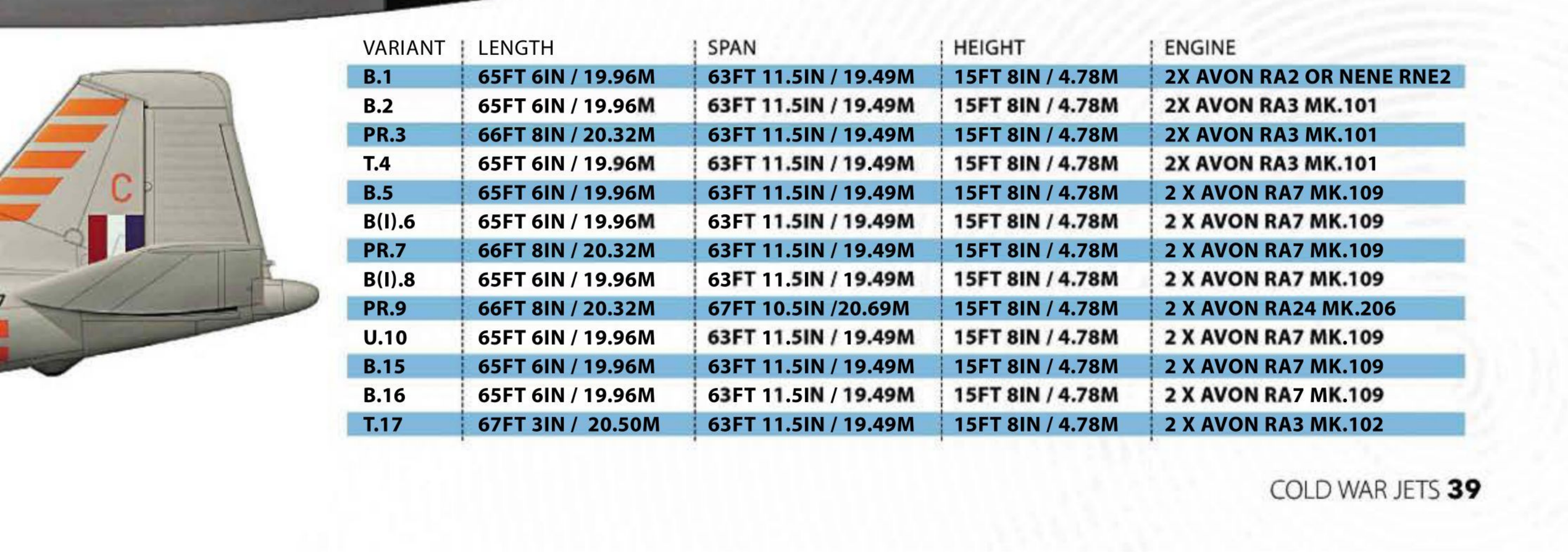
101 Squadron was the first to fly the Canberra in 1951 at RAF Binbrook. WJ611 had minimal markings and just a flash on the nose outlined in Black. WJ611 is finished in all over Aluminium.

## ENGLISH ELECTRIC CANBERRA B2 WJ614 6 SQN

Wearing the squadron band on the tail and the 'flying can opener' on the tip tank is 6 Squadron's WK614. White tail and all over Aluminium. Later converted to TT.18 and used by the Royal Navy.

## ENGLISH ELECTRIC CANBERRA WJ753 100 SQN

Originally delivered to the RAF in 1954 WJ753 was with 100 Sqn when it was written off in 1978. Painted in White and Red but it had been fitted with a replacement camouflaged rudder in 1975.







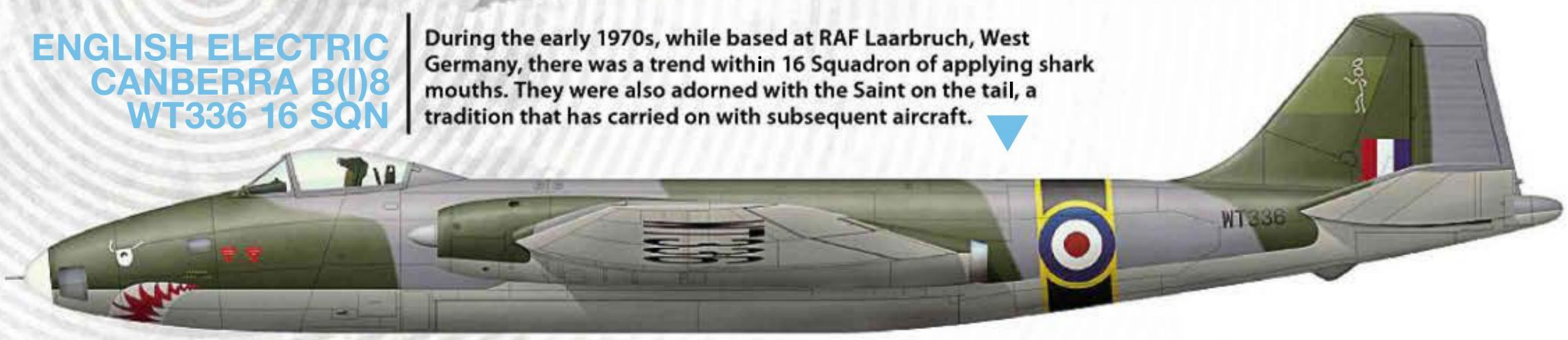
| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| B.1 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2X AVON RA2 OR NENE RNE2 |
| B.2 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2X AVON RA3 MK.101 |
| PR.3 | 66FT 8IN / 20.32M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2X AVON RA3 MK.101 |
| T.4 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2X AVON RA3 MK.101 |
| B.5 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| B(I).6 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| PR.7 | 66FT 8IN / 20.32M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| B(I).8 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| PR.9 | 66FT 8IN / 20.32M | 67FT 10.5IN /20.69M | 15FT 8IN / 4.78M | 2 X AVON RA24 MK.206 |
| U.10 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| B.15 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| B.16 | 65FT 6IN / 19.96M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA7 MK.109 |
| T.17 | 67FT 3IN / 20.50M | 63FT 11.5IN / 19.49M | 15FT 8IN / 4.78M | 2 X AVON RA3 MK.102 |

# ENGLISH ELECTRIC CANBERRA

**IT IS A TESTAMENT TO THE ROBUST YET FLEXIBLE DESIGN THAT OVER 1350 WERE BUILT INCLUDING 403 B-57S**

## ENGLISH ELECTRIC CANBERRA B(I)8 WT336 16 SQN

**During the early 1970s, while based at RAF Laarbruch, West Germany, there was a trend within 16 Squadron of applying shark mouths. They were also adorned with the Saint on the tail, a tradition that has carried on with subsequent aircraft.**




being produced in three batches.

Canberra trials had already reached 54,000ft but the requirement for the new PR.9 was to exceed 60,000ft. Due to a revised nose causing an increase in drag, the PR.9 prototype failed to reach this by 200ft. Even though the prototype retained the B.2 style canopy, production versions had the newer B.8 style configuration. The most notable visual change to other British versions of the Canberra was the wing, which required an increase in span to cope with the altitudes it was expected to operate at.

The standard span being 63ft 11½in (19.5m) whereas the PR.9 had a span of 67ft 11½in (20.7m). With 32 PR.9s built, the first was delivered to the RAF in September 1958 and the type was eventually retired in 2006 when 39 Sqn conducted the last sortie on July 28. One XH143 is still airworthy and regularly displayed.

While the PR.9 was the last variant off the production line for the RAF, 823 having been built, many went on to receive modifications and upgrades to extend their service life. Variants included the U.10 and U.14 which were unmanned types converted from B.2s and used for weapon trials. The T.17 also evolved from the B.2, its most distinctive feature being the addition to the extended nose which housed electronic counter measures systems and provided ECM training. Serving with both the RAF and Royal Navy yet more B.2s were converted for target tug duties, replacing the ageing Meteors.

Over 70 years later, the Canberra is still undertaking operational flights with NASA albeit in the heavily modified WB-57F configuration. It would still be recognised by W E W Petter, however. It is a testament to the robust yet flexible design that over 1350 were built including 403 B-57s.

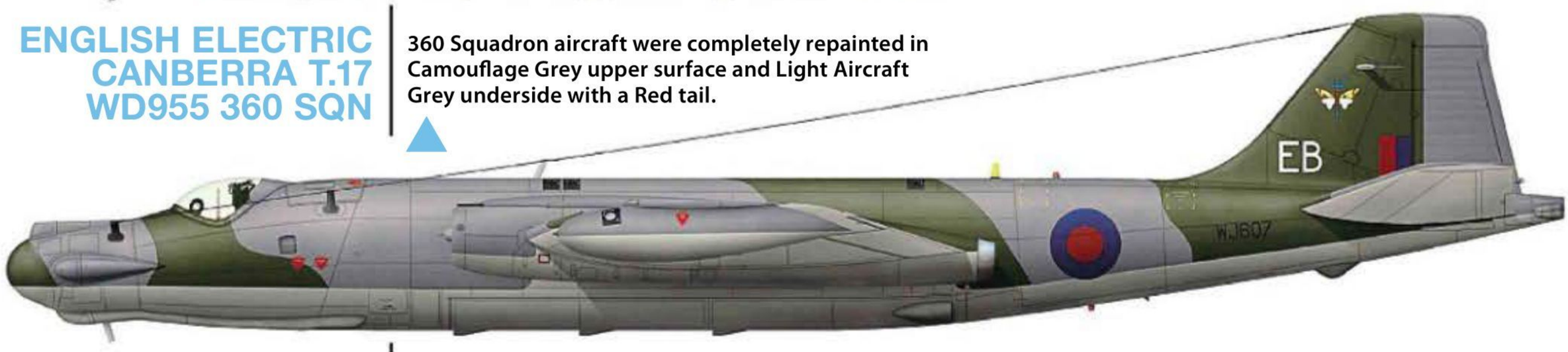
The type served with 17 different air forces and with 61 RAF squadrons, finally being retired 55 years after entering service. Involved in several conflicts around the world, the Canberra proved itself again and again. It proved that despite being the first British jet bomber the design was exceptional and it outlasted many of its successors.

## ENGLISH ELECTRIC CANBERRA T4 WT480 102 SQN

**WT480 was used during 1955 and 1956 as a Training and Checkflight Aircraft by RAF Gütersloh. At the time 102 Squadron was part of 551 Wing and the wing badge was worn on the nose.**

## ENGLISH ELECTRIC CANBERRA T.17 WD955 360 SQN

**360 Squadron aircraft were completely repainted in Camouflage Grey upper surface and Light Aircraft Grey underside with a Red tail.**

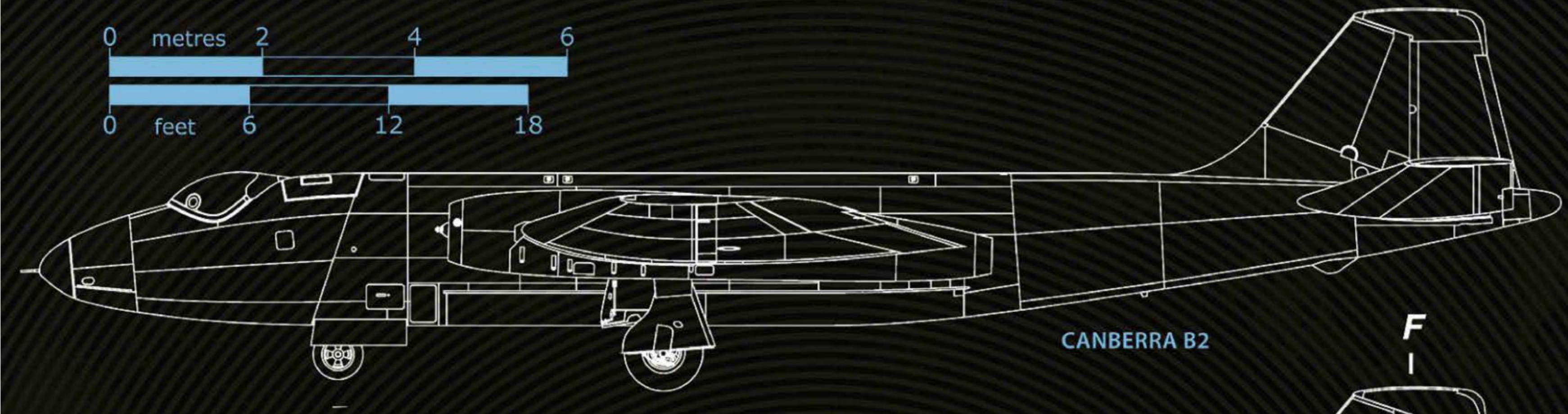



## ENGLISH ELECTRIC CANBERRA T.17 WJ607 360 SQN

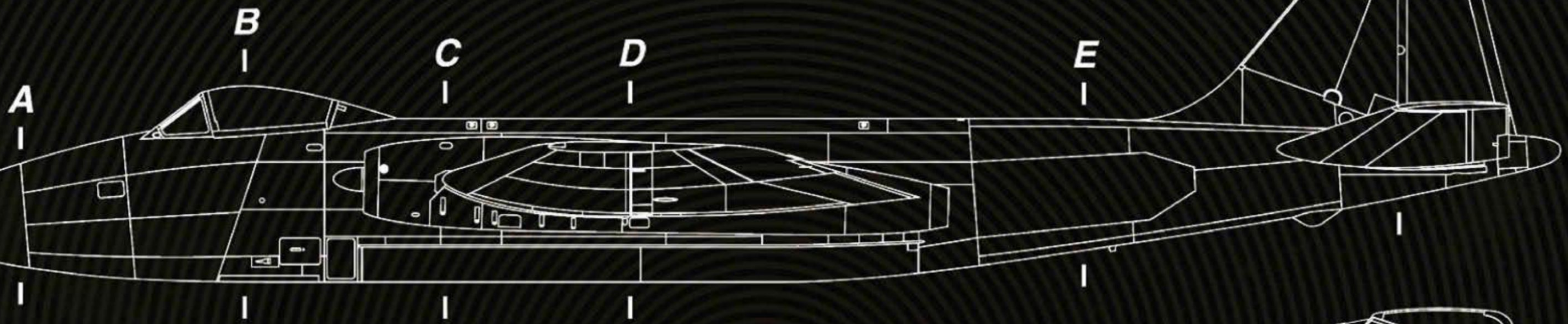
**360 Squadron was a Joint Electronic Warfare Trials and Training Force which operated the T.17 which was a heavily modified B.2. The initial scheme was Dark Sea Grey and Dark Green over Light Aircraft Grey.**

0 metres 2 4 6

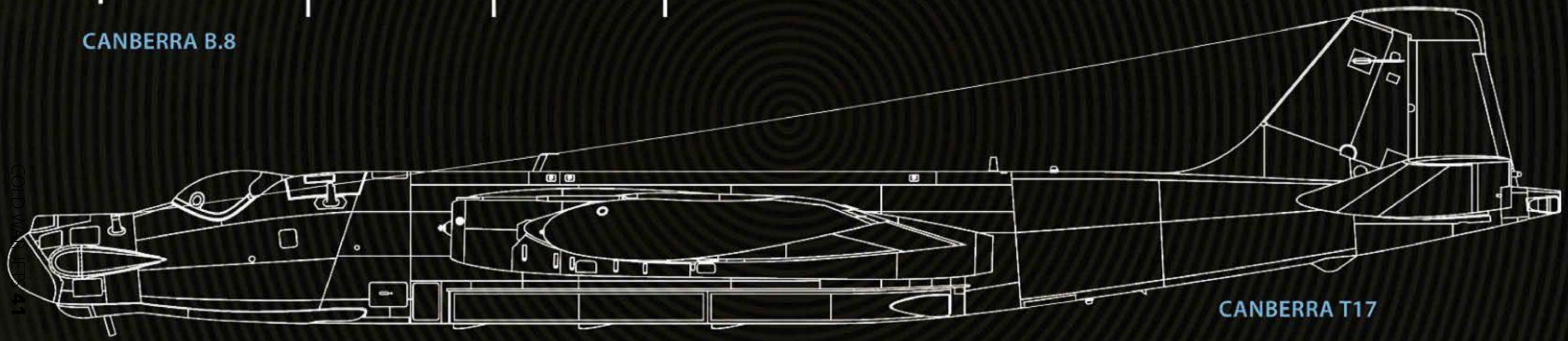
0 feet 6 12 18



CANBERRA B2



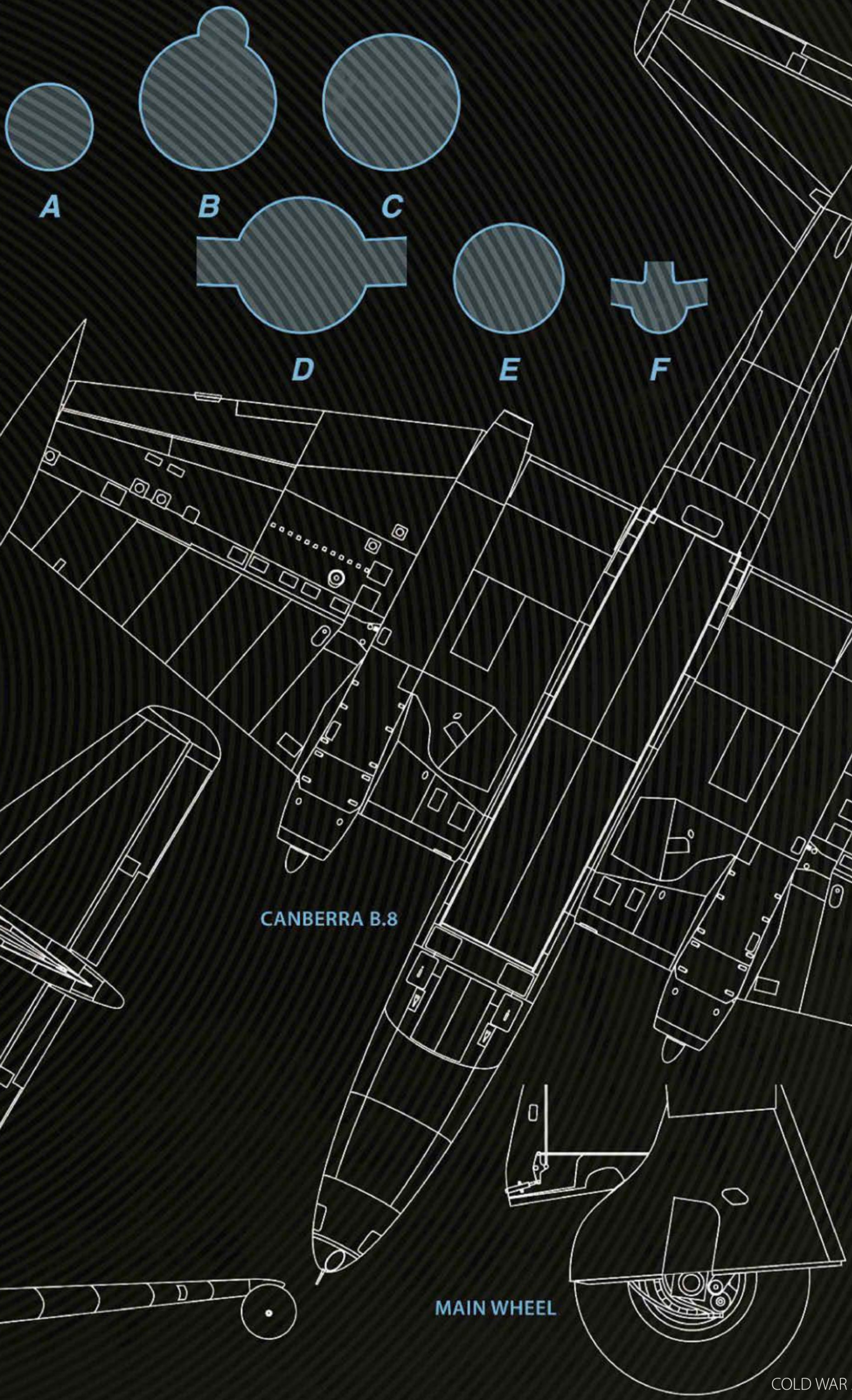

CANBERRA B.8



CANBERRA T17

# ENGLISH ELECTRIC CANBERRA

## PLANS: 1949-2006


A
B
C
D
E
F
CANBERRA B.8
MAIN WHEEL

# SUPERMARINE SWIFT

1948-1967

**In a roundabout way the Swift was part of the Spitfire linage but without the pedigree or reputation. The Spitfire evolved into the Spiteful, which was used as the basis for the Attacker and that in turn became the foundation for the Swift. While other companies were approaching the development of postwar jets with a clean slate, Supermarine continued trying to adapt existing airframes.**

This combined with the competition the Swift faced at the time from the Hunter meant that it received a poor reputation and had only a brief service life.
The Swift did hold the world speed record for a short time and the final operational version was a success with the two squadrons that operated it so it may not have deserved the poor reputation it had quickly gained.

The Swift was the result of two key factors, the first was the company's research into swept wing jets and the second was the need for a fast new day interceptor/fighter. Having already produced the Supermarine Attacker, the company was contracted to explore high speed flight.

A suitable test aircraft was created by taking an Attacker fuselage and fitting wings that had a 40° sweep-back. Known as the Supermarine 510, VV106 first flew in December 1948 and was used for flight testing, even at this stage it was unofficially being called the Swift, a name that would stick.

Running concurrently with this was a similar project at Hawker. The Ministry of Supply wanted to ensure that either the Swift or the Hunter succeeded for the sake of Britain's air defences.

VV106 was joined by a second experimental aircraft in 1950. VV119 featured a number of

design improvements including a longer nose, revised tail, a change in the undercarriage configuration and the installation of a Nene engine.

As the programme progressed there were ongoing alterations as test results came in and the aircraft was now visually more akin to what would become the Swift F.1 than the Attacker.

As tensions rose in Europe and the conflict in Korea escalated, the need for a jet fighter to counter the Communist air forces was increasingly urgent and the development of the Swift had to be progressed as rapidly as possible. There was a hope that the Swift would start entering service by October 1952 and an order for 150 was placed.

WJ960 was the first of the pre-production prototypes and differed little from the final iteration of VV119. The wings had a slight curve and the ailerons had been enlarged but it was still not the complete package.

Instead the second pre-production WJ965 prototype was much closer to the F.1, the fin size had been increased, the layout and size of the cockpit revised and the fuel capacity had been increased. It flew for the first time on July 14, 1952, and two years later succeeded in breaking the sound barrier with David Morgan, one of Supermarine's test pilots, at the controls.

By August 1952 the first F.1 had been completed and WK194 flew on the 25th. It spent its life with A&AEE at Boscombe Down before being used as a ground trainer and later scrapped. Several other early production F.1s were used for a variety of testing and development roles. Some such as WK198 and WK200 were used as the basis for later variants, the F.4 and F.5 respectively. It was only from WK205 onwards that the aircraft served with front line squadrons.

56 Squadron received their first F.1 on February 20, 1954, when it was escorted by a pair of Meteors to RAF Waterbeach. Initially the Swift was welcomed by its pilots, who had been

**THE MINISTRY OF SUPPLY WANTED TO ENSURE THAT EITHER THE SWIFT OR THE HUNTER SUCCEEDED FOR THE SAKE OF BRITAIN'S AIR DEFENCES**

## SUPERMARINE SWIFT FR.5 WK277 2 SQN

**WK277 was originally designated an F.4 during construction but upgraded to FR.5. It served with 2 Squadron between 1959 and 1961. It was then retired and used as a ground trainer at RAF Cosford. Currently on display at Newark Air Museum.**

# SUPERMARINE SWIFT

**TO EXTEND THE RANGE, PROVISION WAS MADE TO FIT A BELLY TANK BUT AT THE COST OF SOME SPEED**

used to the already dated Meteor. Before the end of the month the squadron received three more and a conversion programme was initiated. During this period the Swift began earning notoriety, several aircraft being lost during the spring with serviceability being a major factor.

Before a single F.1 had entered service however, work had commenced on subsequent variants of the Swift. The F.2 had provision for extra guns in the lower fuselage but this led to stability issues and the F.3 was fitted with reheat. Despite this, no F.3 ever entered service, the entire run being relegated to the ignominious role of instructional airframes.

WK198 was used as the basis for the F.4 variant and was used by Supermarine to break the world speed record, which had previously been gained by Neville Duke in Hawker Hunter WB188 on September 7, 1953.

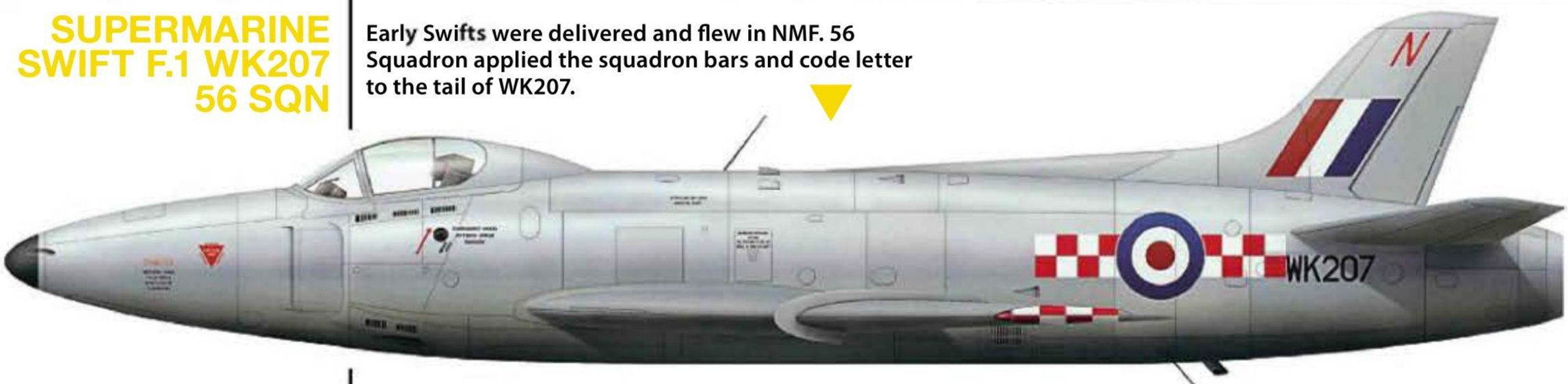
Later in the month WK198, by now painted light blue, was dispatched to Libya for an attempt where higher ambient temperatures meant a rise in the speed required to reach a Mach number, instead of the weather Britain typically experienced in late September. Based at Idris Airfield the team had everything in place and ready for an attempt on September 25. Following four runs, an average speed of 735.7 mph was officially recorded. WB188 survived and is currently at Brooklands.

It was becoming clear with the introduction of the Hunter and comparable US aircraft, that the Swift was struggling. It lacked the performance and handling that a dedicated fighter required. At the same time the reconnaissance version of the Meteor was looking antiquated and a replacement would have to be sought.

The reconnaissance role was ideally suited to a converted fighter as it would be flying fast and at very low level but also be able to evade fighters or at the very least be able to survive a dog fight.

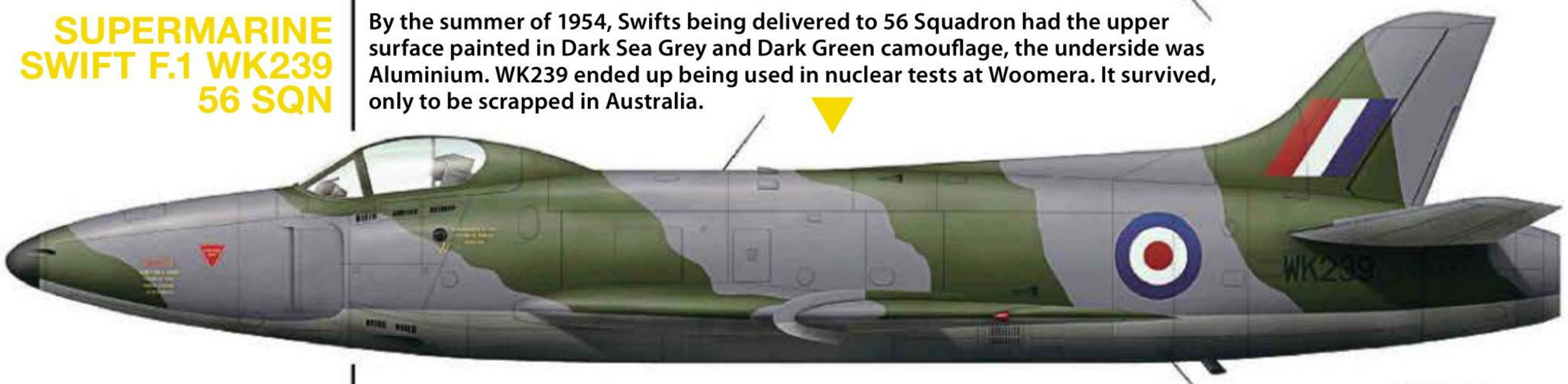
## SUPERMARINE SWIFT F.1 WK207 56 SQN

**Early Swifts were delivered and flew in NMF. 56 Squadron applied the squadron bars and code letter to the tail of WK207.**



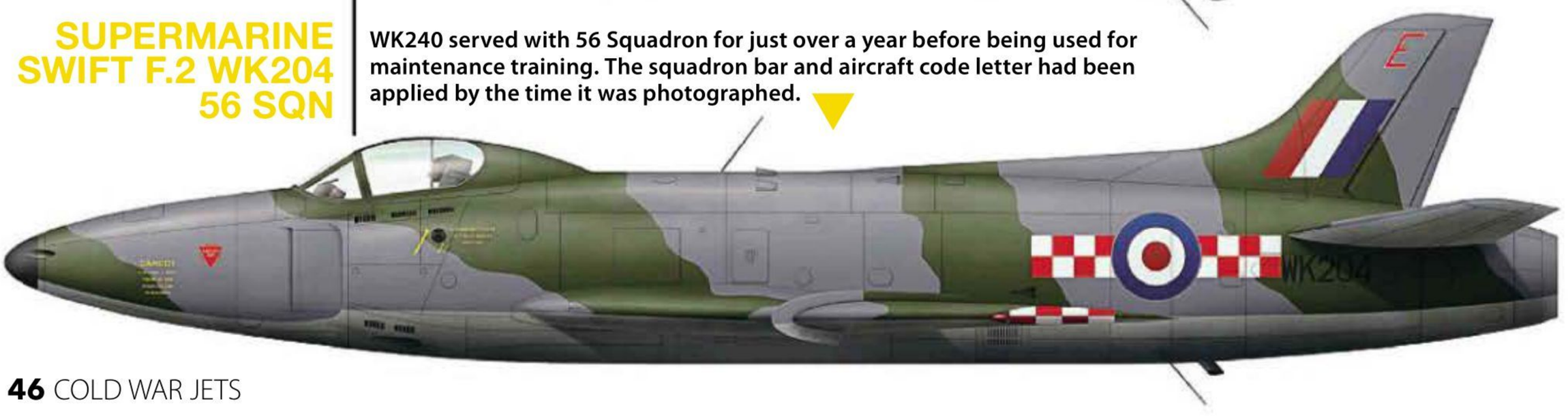

## SUPERMARINE SWIFT F.1 WK239 56 SQN

**By the summer of 1954, Swifts being delivered to 56 Squadron had the upper surface painted in Dark Sea Grey and Dark Green camouflage, the underside was Aluminium. WK239 ended up being used in nuclear tests at Woomera. It survived, only to be scrapped in Australia.**




## SUPERMARINE SWIFT F.2 WK204 56 SQN

**WK240 served with 56 Squadron for just over a year before being used for maintenance training. The squadron bar and aircraft code letter had been applied by the time it was photographed.**



## SUPERMARINE SWIFT F.3 WK264 15 MAINTENANCE UNIT

Several F.3 never made it to a front line squadron, instead they ended up at 15 Mu such as the one based at RAF Wroughton and used as ground trainers at various RAF bases. Having been delivered in January 1956 it was scrapped two years later.

## SUPERMARINE SWIFT F.1 WK200 A&AEE ▼

WK277 was originally designated an F.4 during construction but upgraded to FR.5. It served with 2 Squadron between 1959 and 1961. It was then retired and used as a ground trainer at RAF Cosford. Currently on display at Newark Air Museum.

## SUPERMARINE SWIFT F.4 WK198 ▲

Built as an F.1, WK198 became the F.4 prototype. It was painted Light Blue when it broke the world speed record in Libya on September 25, 1953.

## SUPERMARINE SWIFT FR.5 WK293 4/79 SQN

For a very brief period, 4 Squadron operated the Swift when 79 Squadron was renumbered on January 1, 1961, hence the dual squadron markings on WK293. However 4 Squadron quickly returned to operating the Hunter. ▼

Testing of the F.4 by A&AEE indicated that many of the handling issues had been improved and the Swift could be considered for conversion.

The FR.5 received a revised nose which would house three oblique cameras. It could call upon reheat should it need extra speed but should not rely on it as this would have a detrimental impact on range. To extend the range, provision was made to fit a belly tank but at the cost of some speed. It also retained two Aden cannon.

2 and 79 Squadrons, both based in West Germany were selected to operate the type and deliveries commenced in mid-1956. The FR.5 performed the task admirably and was far more suited to the reconnaissance role than as a fighter, flying with the two squadrons for five years until the much more capable Hunter FR.10 was ready.

During this transition period, on December 30, 1960, 79 Squadron was disbanded. Many elements were taken over by a re-formed 4 Squadron, this included the remaining Swifts, two of which briefly wore both 79 and 4 Squadron markings.

Two final variants of the Swift were developed. Only one PR.6 was built and even then the project was cancelled before construction was completed. The F.7 was intended to intercept bombers and carry four AAMs, these would be the Fireflash and later Firestreak. It also featured a revised canopy, the Avon 116 and a new nose which would accommodate the Ekco radar which was used by the Fireflash.

In total 14 were completed and all were used in testing by the Guided Weapons Development Squadron at RAF Valley. The F.7 was eventually replaced by Javelins in 1958.

Only 197 Swifts were built, far fewer than any other postwar RAF fighter but the pace of technological advancement combined with the number of jets being commissioned by the Ministry of Supply during the Cold War arms race meant that some would just not be as successful as others and the Swift was one such aircraft. Much that was learnt from the Swift went into the final Supermarine aircraft, the Scimitar and despite the low numbers built several airframes have survived at museums around the country. ⊙

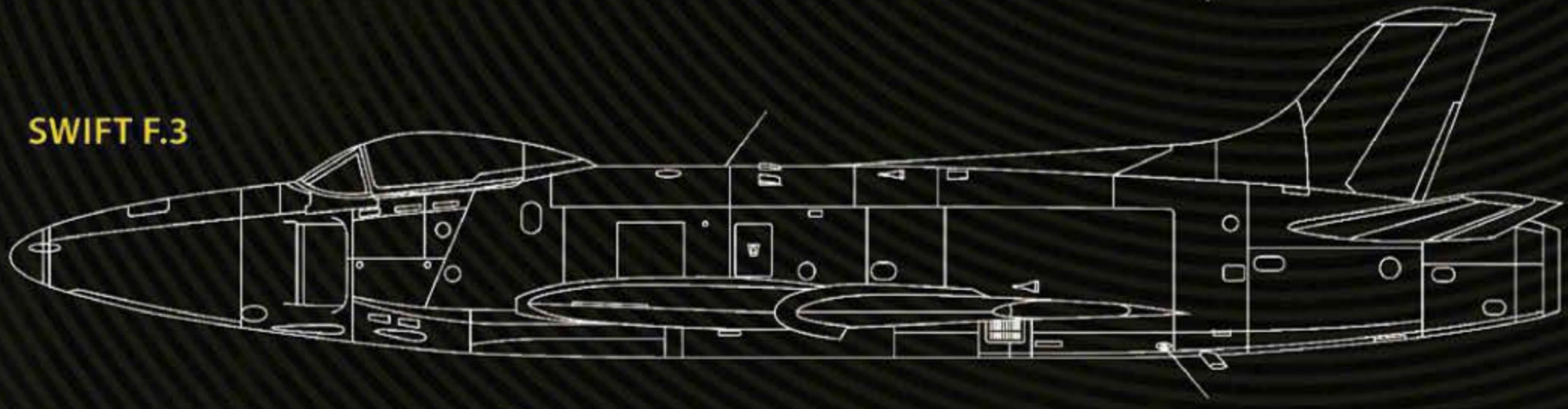
| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| F.1 | 41FT 5.5IN/12.66M | 32FT 4IN/9.86M | 12FT 6IN/3.81M | RR AVON RA.7 |
| F.2 | 41FT 5.5IN/12.66M | 32FT 4IN/9.86M | 12FT 6IN/3.81M | RR AVON RA.7 |
| F.4 | 41FT 5.5IN/12.66M | 32FT 4IN/9.86M | 12FT 6IN/3.81M | RR AVON RA.7R |
| F.5 | 42FT 3IN/12.88M | 32FT 4IN/9.86M | 13FT 6IN/4.11M | RR AVON 114 |
| F.7 | 43FT 9IN/13.34M | 35FT/10.67M | 13FT 6IN/4.11M | RR AVON 116 |

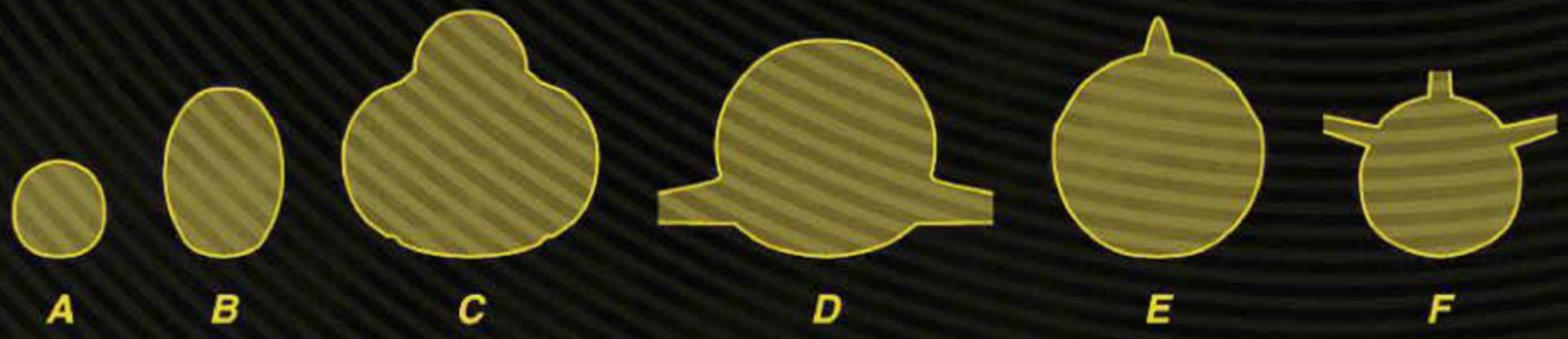
# SUPERMARINE SWIFT PLANS: 1948 - 1968

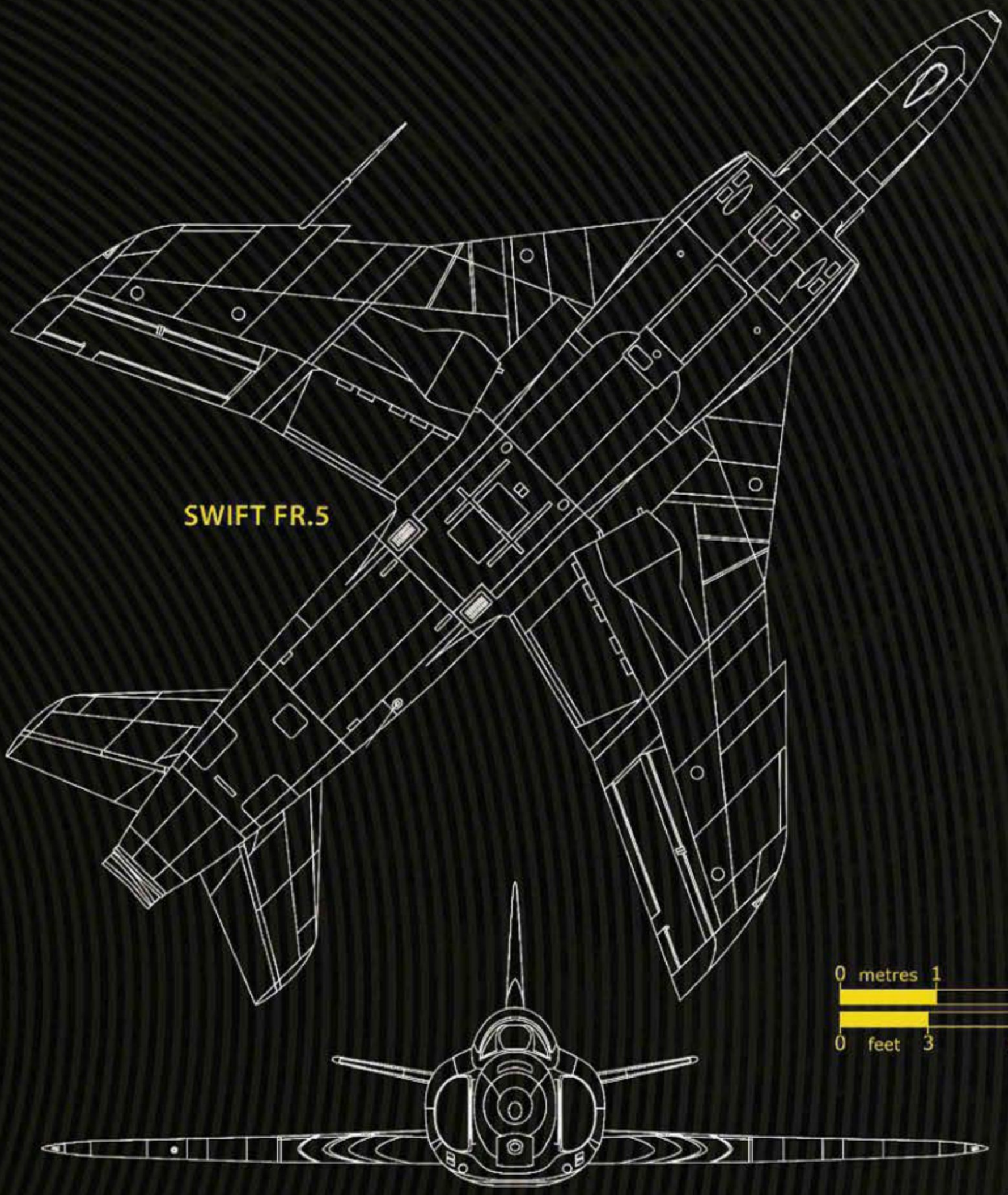
SWIFT FR.5

SWIFT F.1

SWIFT F.3

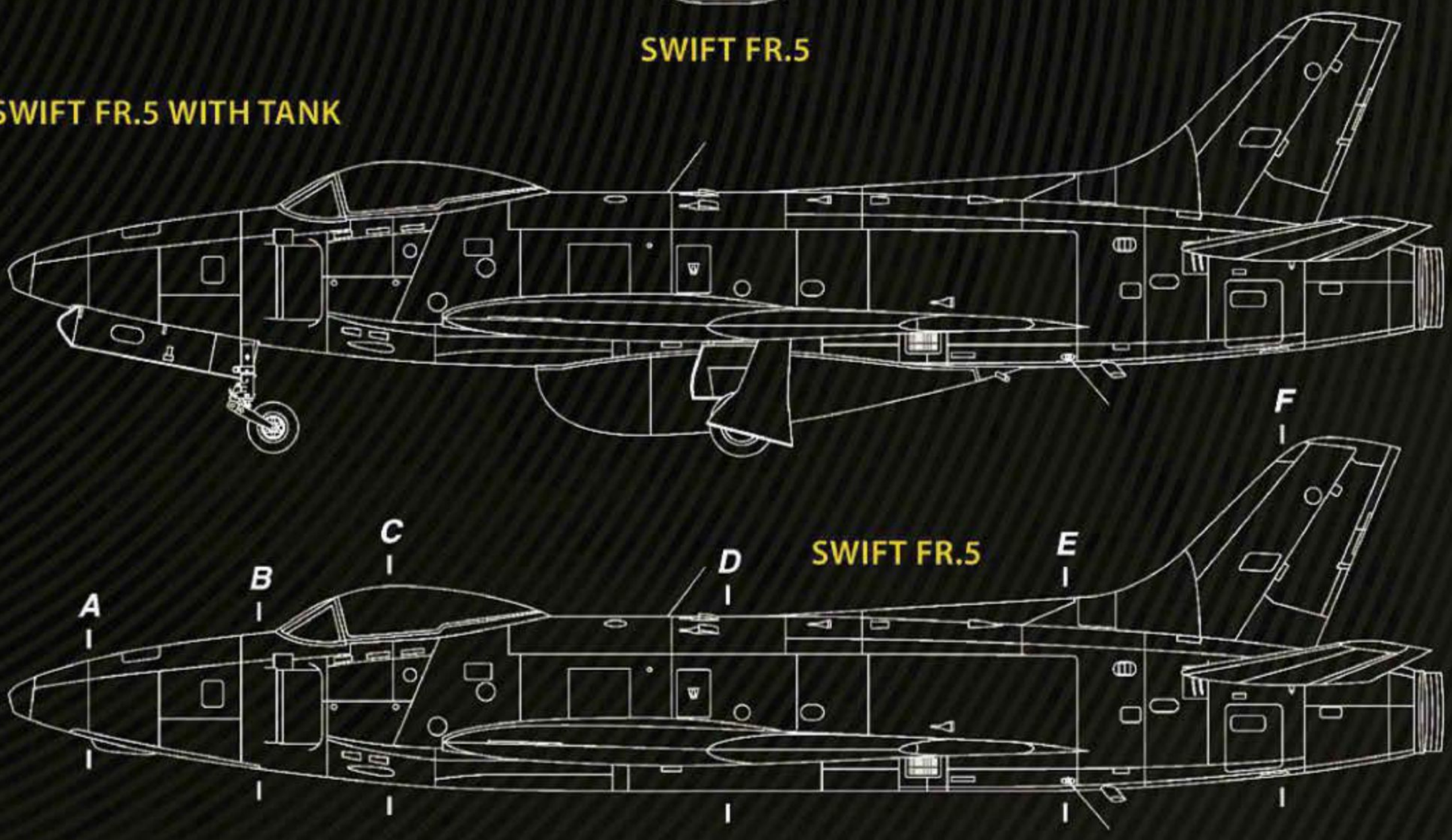







SWIFT FR.5

SWIFT FR.5 WITH TANK



# HAWKER HUNTER

1953-1994

**Arguably no other postwar aircraft has lines as clean and elegant as the Hawker Hunter. The Hunter certainly epitomises the old adage 'if it looks right it will fly right'. Like other early postwar jets the Hunter has certainly earned its reputation as a robust yet versatile aircraft, remaining in military service for 60 years, flying with 22 air forces and engaging in conflicts across the globe. Many continue to fly to this day, though not with any national air forces; instead they are maintained and flown by companies with private air forces. Others are in private hands and can be regularly seen at air shows.**

During the early postwar years the consensus was that bombers would fly at high altitude to avoid ground based defences. Countering this threat meant a fighter interceptor was required that could reach the bombers. Specifications F.43/46 and F.44/46 were issued in January 1947 and required day and night fighters that could climb to an altitude of 45,000ft/13,717m in under six minutes while being able to fly at 629mph (Mach 0.953). With other companies tied up developing the V Force aircraft, Hawker was approached to submit a proposal.

The company had already begun work exploring swept wing performance with the P.1052 which was a Sea Hawk fuselage and swept wings which would became the foundation for the Hunter. The first prototype, VX272, remained largely unchanged but following test flights the second prototype (VX279) saw extensive modifications to the tail, again bringing it closer to the Hunter shape. As a result of these changes it was redesignated the P.1081.

**DURING THE EARLY POSTWAR YEARS THE CONSENSUS WAS THAT BOMBERS WOULD FLY AT HIGH ALTITUDE TO AVOID GROUND BASED DEFENCES**

Hawker's response to the specification was the P.1067, which used the new Rolls-Royce AJ.65 and which was soon to be renamed the Avon. Early sketches had the intake in the nose along the lines of the F-86 Sabre and MiG 15 along with a T-tail similar to that of the Javelin. The tail position was soon lowered and the intakes moved to the wing roots echoing the Sea Hawk. These refinements led to a revision of the original specification which had called for a high tail, nose intake aircraft.

As the design process continued the Government placed an order for three prototypes. Through constant testing, the shape of the P.1067 evolved so that by the time the first prototype (WB188) took to the air on July 20, 1951, it was visually almost identical to the Hunter F.1. The second prototype (WB195) didn't fly until a year later but was fitted with four 30mm Aden cannon and a gunsight. One notable issue with the prototypes was elevator flutter which caused heavy vibration when the aircraft was in a dive. The issue having been resolved, WB195 exceeded Mach 1 for the first time during a shallow dive on June 24, 1952.

## HUNTER FGA.9 XF442 1 SQN

**In protest against RAF cuts and the lack of recognition of the 50th anniversary of the RAF, Alan Pollock flew XF442 through the spans of Tower Bridge on April 5, 1968, having beat up Parliament. He was later officially discharged on medical grounds.**

Such was the confidence in the new Hunter that orders for production aircraft were placed before WB188 had flown. The order was for both the F.1, which was Avon powered, and the Sapphire-powered F.2. Early F.1s were used for trials and evaluation, these highlighted issues such as engine surges and even flame outs caused by the firing of the guns. An interim solution was to reduce fuel flow to the engine with the F.1 and F.2.

It was subsequently resolved with changes introduced to the F.4. Flight time was very low, flying time being as little as 40 minutes under certain circumstances due to the 330 gallon/1500 litre capacity. The prototypes and the first production Hunters lacked an adequate air brake, following

# HAWKER HUNTER

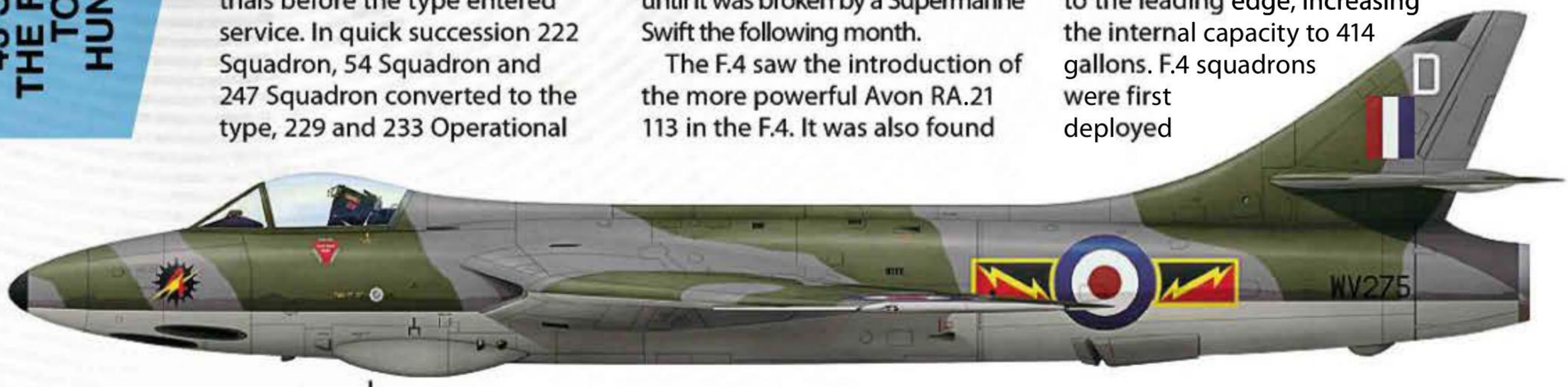
**43 SQUADRON WAS THE FIRST SQUADRON TO RECEIVE THE HUNTER F.1 IN JULY 1954**

experiments on WB188 the single ventral air brake was considered the best solution and introduced in time to be fitted to the 12th production Hunter.

43 Squadron was the first squadron to receive the Hunter F.1 in July 1954. Prior to this early deliveries had been made to the Central Fighter Establishment who conducted operational trials before the type entered service. In quick succession 222 Squadron, 54 Squadron and 247 Squadron converted to the type, 229 and 233 Operational Conversion Units were also set up. Despite early teething problems the Hunter was very popular with pilots.

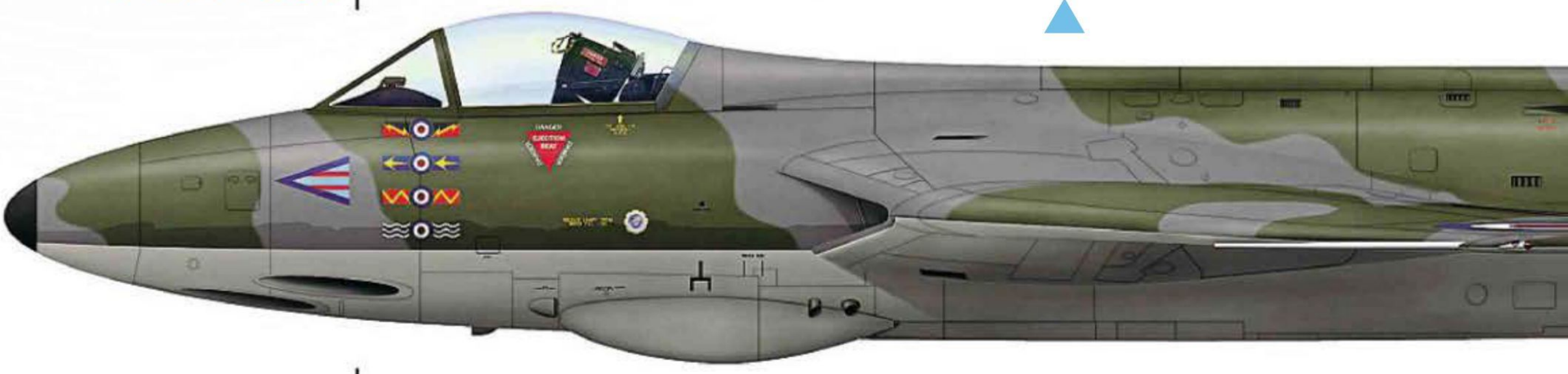
The only F.3 was the modified prototype WB188 which had been adapted for attempts on the world speed record by Neville Duke. Painted in high gloss red and fitted with an aerodynamic nose cone it managed to briefly hold the record until it was broken by a Supermarine Swift the following month.

The F.4 saw the introduction of the more powerful Avon RA.21 113 in the F.4. It was also found that the spent casings and links caused damage to the fuselage, the light weight stopping them falling away quickly enough. So the solution was to collect these in pods that are a distinctive feature of the Hunter. The F.4 also saw the introduction of the wing pylon for external fuel tanks to overcome the limited range. Small fuel tanks were also added to the leading edge, increasing the internal capacity to 414 gallons. F.4 squadrons were first deployed




**HUNTER F.4 WV275 4 SQN**

**F.4 WV275 served with 4 Sqn from July 1955 until March 1957 when it was allocated to 111 Sqn. Painted in Dark Green, Dark Sea Grey with Light Aircraft Grey underside.**



**HUNTER F.4 XE665 122 WING**

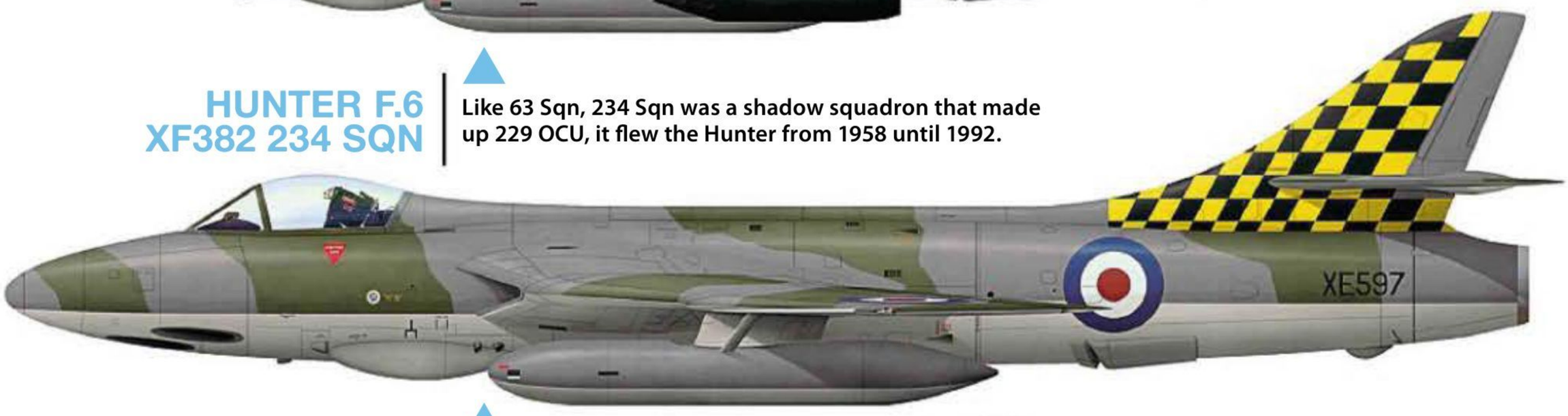
**Flown by Wing Commander Hammer West of 122 Wing, XE665 has the pennant and bars of the four squadrons (4 Sqn, 93 Sqn, 98 Sqn and 118 Sqn) based at Jever during the mid-1950s.**

**HUNTER F.5 WP130 34 SQN**

**34 Squadron were based at Cyprus in late 1956 to support operations during the Suez crisis. Identification markings were hastily applied in black and yellow bands on the fuselage and wings, as seen on WP130.**

## HUNTER F.6 XF382 234 SQN

**Like 63 Sqn, 234 Sqn was a shadow squadron that made up 229 OCU, it flew the Hunter from 1958 until 1992.**

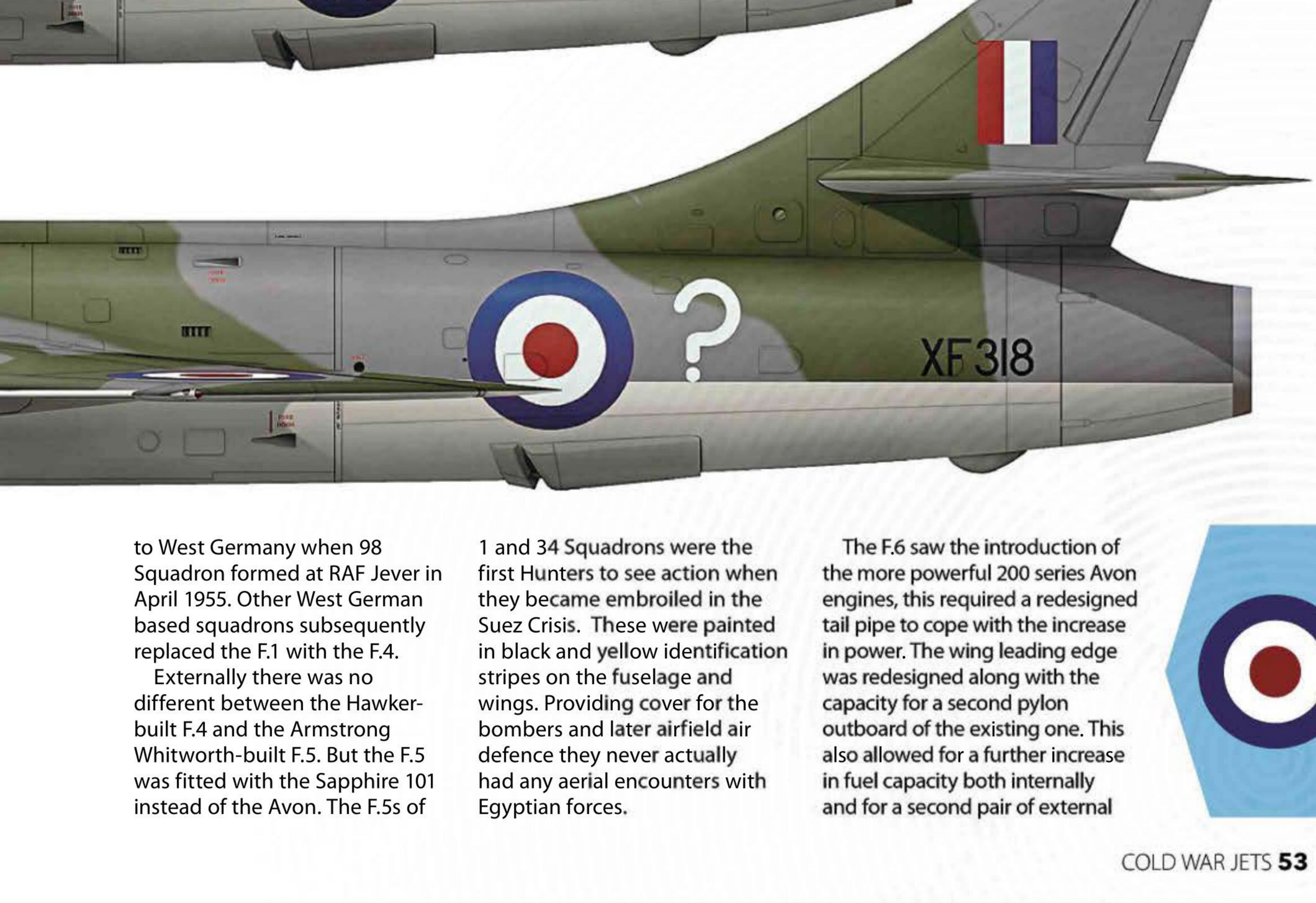



## HUNTER F.6 XE597 63 SQN

**As a shadow unit for 229 OCU, 63 Sqn operated the Hunter from 1956 until 1992 when it was disbanded.**

## HUNTER F.4 XF318 112 SQN

**112 Sqn was the only F.4 unit to have the sharkmouth while based at Bruggen in 1957. Pictured is F.4 XF318.**




to West Germany when 98 Squadron formed at RAF Jever in April 1955. Other West German based squadrons subsequently replaced the F.1 with the F.4.

Externally there was no different between the Hawker-built F.4 and the Armstrong Whitworth-built F.5. But the F.5 was fitted with the Sapphire 101 instead of the Avon. The F.5s of 1 and 34 Squadrons were the first Hunters to see action when they became embroiled in the Suez Crisis. These were painted in black and yellow identification stripes on the fuselage and wings. Providing cover for the bombers and later airfield air defence they never actually had any aerial encounters with Egyptian forces.

The F.6 saw the introduction of the more powerful 200 series Avon engines, this required a redesigned tail pipe to cope with the increase in power. The wing leading edge was redesigned along with the capacity for a second pylon outboard of the existing one. This also allowed for a further increase in fuel capacity both internally and for a second pair of external

# COLD WAR JETS HAWKER HUNTER

**HUNTER F.6**
**XG200 111 SQN**

During the late 1950s the official display team of the RAF was 111 Squadron's Black Arrows. They hold the record for looping in formation 22 aircraft in 1958. The aircraft, like XG200, were painted in Gloss Black.

**HUNTER F.6**
**XG225 92 SQN**

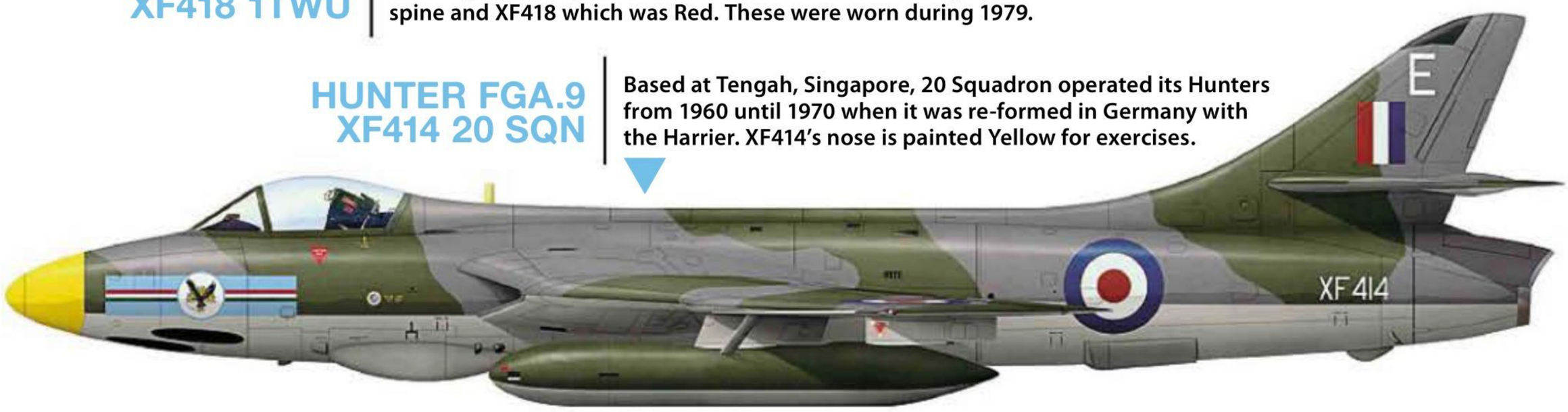
In 1960 92 Sqn formed the Blue Diamonds using Hunters painted in Aircraft Blue, during 1961 and 1962 they were the official aerobatic team representing the RAF.

**HUNTER FGA.9**
**XF418 1TWU**

The Tactical Weapons Unit painted some Hunters in high visibility markings including XG225 which had a Yellow tail, wingtips and spine and XF418 which was Red. These were worn during 1979.

**HUNTER FGA.9**
**XF414 20 SQN**

Based at Tengah, Singapore, 20 Squadron operated its Hunters from 1960 until 1970 when it was re-formed in Germany with the Harrier. XF414's nose is painted Yellow for exercises.




**F.6S WERE PHASED IN DURING 1956, WITH 19 SQUADRON BEING THE FIRST TO RECEIVE THEM**

tanks. The pylons also now had the provision to carry a range of ordnance from rockets to bombs, all the changes to the wing were known as Mod 228. There was also a revision of the starter system with the old cartridge type being replaced with the AVPIN system. Many F.6s were also later upgraded to FGA.9 spec.

F.6s were phased in during 1956, with 19 Squadron being the first to receive them. But as a fighter interceptor the Hunter's days were numbered, the English Electric Lightning could easily outperform the subsonic Hunters and began replacing them in 1961.

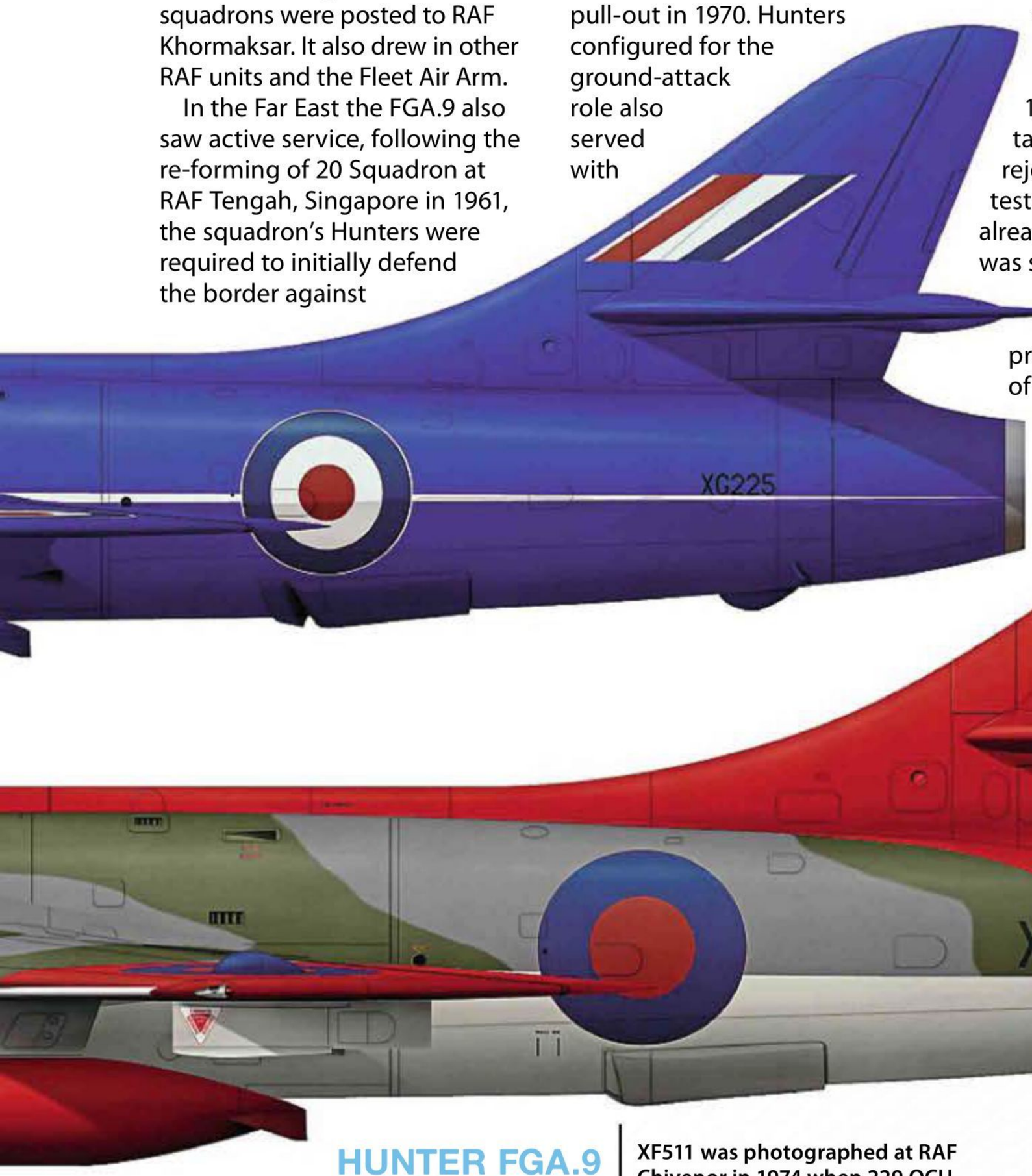
Construction of new airframes may have ceased but it was not the end of the development of the Hunter. In terms of performance the Venom was showing its age and a replacement for the ground-attack role was necessary. Converting existing Hunters for this change of role was considered a viable and cost-effective solution. The FGA.9 received the more powerful and reliable Avon 207 engine, the wings were further strengthened to carry heavier weapon loads and the outer pylon was fitted with explosive bolts should it need to be ejected in an emergency.

The cockpit also received air conditioning for tropical operations. The conversion proved to be fortuitous when Hunter FGA.9s of 208 Squadron

relocated from Kenya to Aden in 1961 where they operated in close support of British ground forces. As the conflict grew, more Hunter squadrons were posted to RAF Khormaksar. It also drew in other RAF units and the Fleet Air Arm.

In the Far East the FGA.9 also saw active service, following the re-forming of 20 Squadron at RAF Tengah, Singapore in 1961, the squadron's Hunters were required to initially defend the border against Indonesian forces opposed to the formation of Malaysia. The squadron continued to support British forces until the eventual pull-out in 1970. Hunters configured for the ground-attack role also served with several foreign air forces, further proving the success of the type.

In keeping with the need to train pilots, a two-seater version of the Hunter was developed by Hawker when an order was placed in 1954. The originally intended tandem configuration was rejected following wind tunnel tests and the side-by-side layout already seen in the Vampire was selected, this in spite of the original concerns that a less streamlined profile would result in a loss of performance.




## HUNTER FGA.9 XF511 229 OCU

XF511 was photographed at RAF Chivenor in 1974 when 229 OCU had relocated RAF Brawdy.

## HUNTER FGA.9 XJ642 54 SQN

From 1955 until 1969, 54 Squadron operated several variants of the Hunter including the FGA.9 while based at RAF West Raynham in the late 1960s.

## HUNTER FGA.9 XF414 20 SQN

Based at Tengah, Singapore, 20 Squadron operated its Hunters from 1960 until 1970 when it was re-formed in Germany with the Harrier. XF414's nose is painted Yellow for exercises.

# HAWKER HUNTER

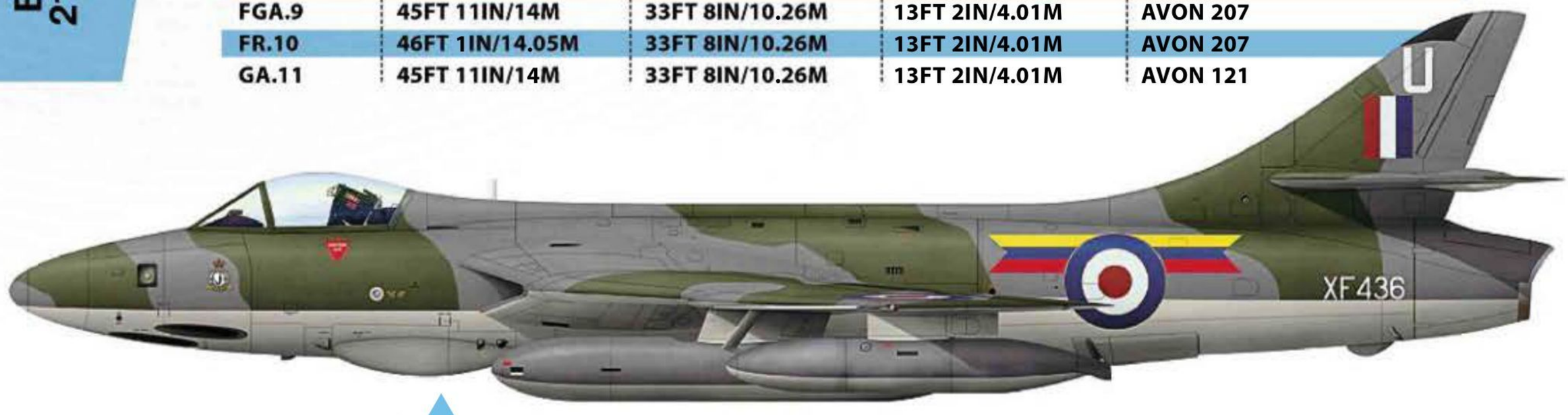
**WITH NEARLY 2000 HUNTERS BEING BUILT AND EXPORTED TO 21 NATIONS, MANY HUNTERS ARE STILL FLYING AROUND THE WORLD**

With a wider forward section the fairing aft of the cockpit saw several modifications until finalised in 1965. The sliding canopy was also exchanged with the wider lifting version. The tail also saw the addition of a braking parachute and slightly modified tailpipe. This feature was also included in the FGA.9 and retrofitted to many older fighters.

Fifty-five T.7s were ordered initially but 10 of these were built as the navalised T.8, furthermore the design of the F.4 made it a relatively straightforward process to convert them to T.7 configuration. The T.7 eventually entered service with 229 OCU at RAF Chivenor in 1958 and went on to also equip many of the front line squadrons, remaining in service with the RAF for many years.

With nearly 2000 Hunters being built and exported to 21 nations, many Hunters are still flying around the world and it is a testament to the sheer quality of possibly the most successful of British postwar military jets.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| P.1067 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 103 |
| F.1 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 113 |
| F.2 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | SAPPHIRE 101 |
| F.3 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 115 |
| F.4 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 113 OR 121 |
| F.5 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | SAPPHIRE 101 |
| F.6 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 203 |
| T.7 | 48FT 10IN/14.88M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | SEVERAL AVON VARIANTS |
| T.8 | 48FT 10IN/14.88M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | SEVERAL AVON VARIANTS |
| FGA.9 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 207 |
| FR.10 | 46FT 1IN/14.05M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 207 |
| GA.11 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 121 |




## HUNTER FR.10 XF436 8 SQN

**The squadron was based at RAF Khormaksar following the Second World War until 1967, mainly operating the FGA.9 but B flight had four FR.10s on strength from 1961.**

## HUNTER T.7 XL565 208 SQN

**earing 208 Sqn markings XL565 was allocated to 1417 Flight which was a reconnaissance unit based at RAF Khormksar which took over duties from 8 Sqn. The flight consisted of five FR.10s and the single T.7.**

## HUNTER T.7 XL573 12 SQN

**While flying the Buccaneer, the squadron retained the Hunter for a range of duties during the 1980s. XL573 is now privately owned and still flies.**

## HUNTER T.7 XL620 74 SQN

**The squadron replaced its Meteors with Hunter F.4s and F.6s in 1957 but also had XL620 for a brief period from 1959 to 1960 for training and familiarisation purposes. Painted in all over Aluminium with Yellow band.**

## HUNTER T.7 XL621 4 FLYING TRAINING SCHOOL

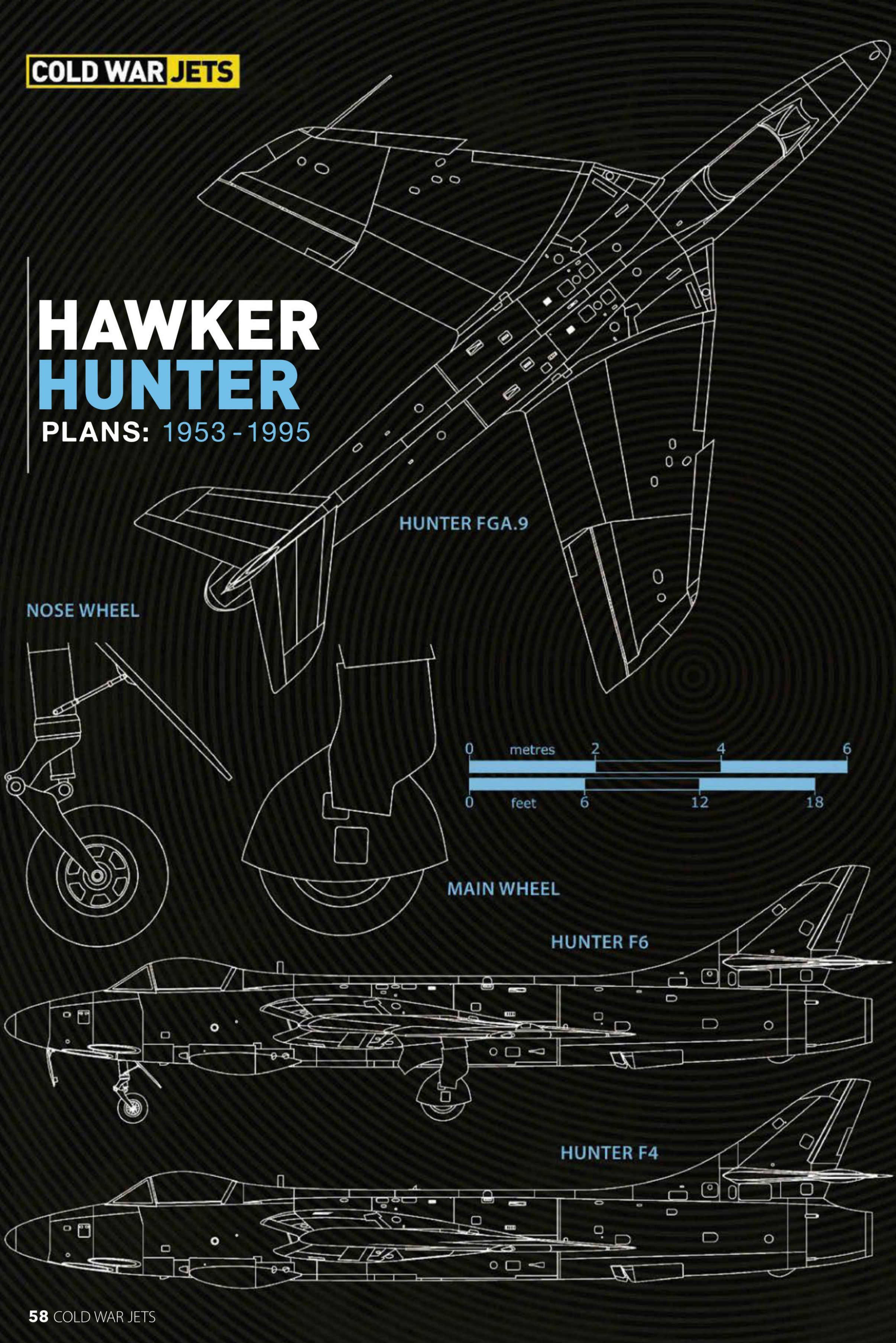
**XL621 received high visibility markings of a White tail, spine and wing tips along with Red tanks while serving with 4 FTS during 1973.**

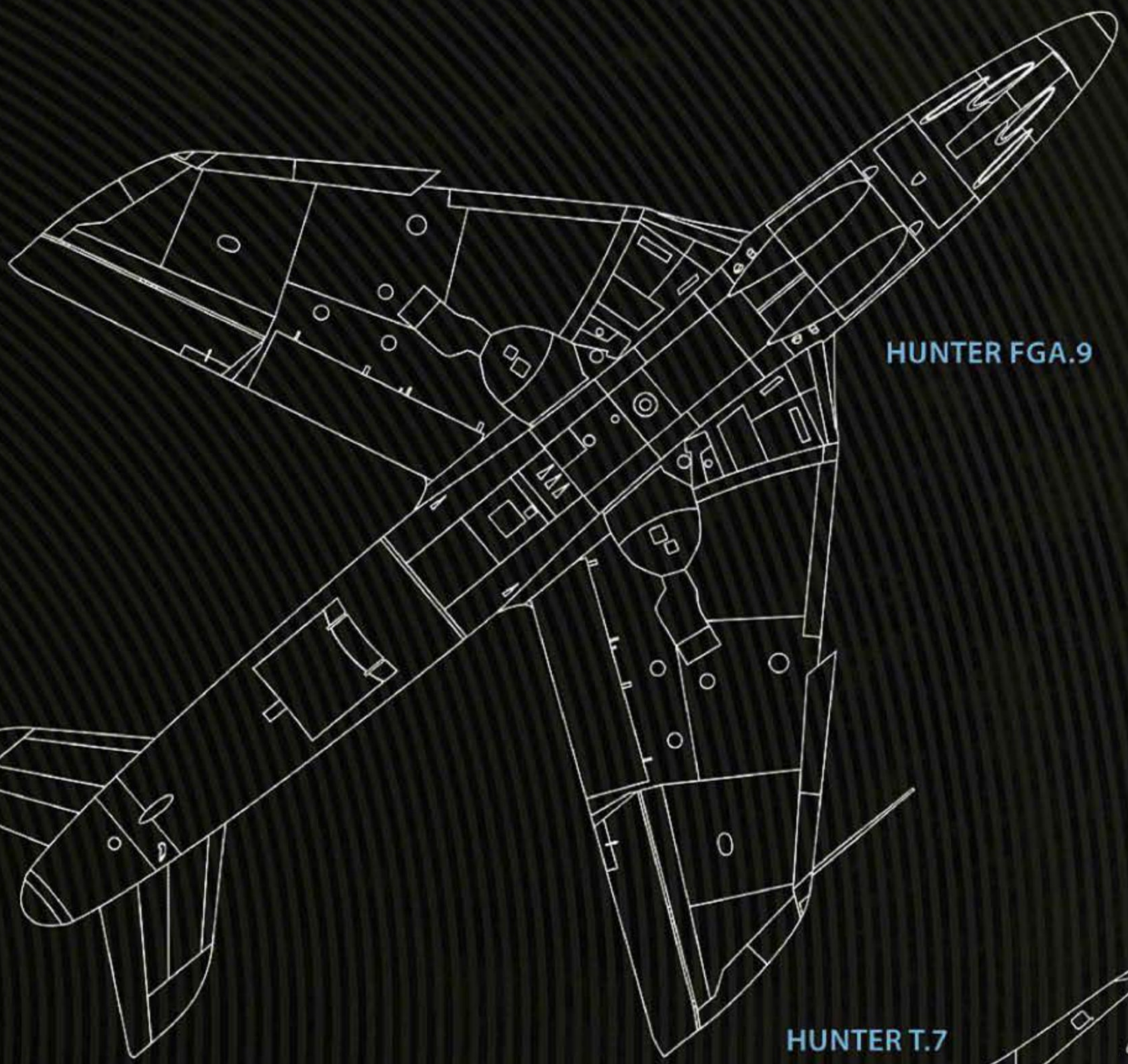
## HAWKER HUNTER T.7 WV383 DRA

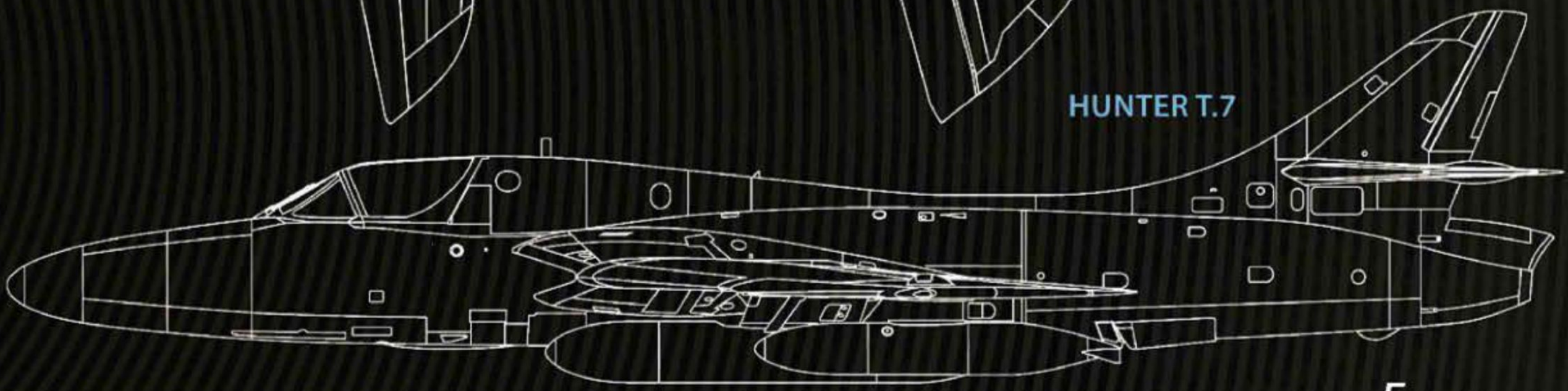
**Originally built as a F.4, WV383 was converted to T.7 following an accident in 1955. In 1971 it was allocated to RAE Farnborough and flown until 1998 in Raspberry Ripple, Red, White and Oxford Blue. Currently on display at Farnborough Museum.**

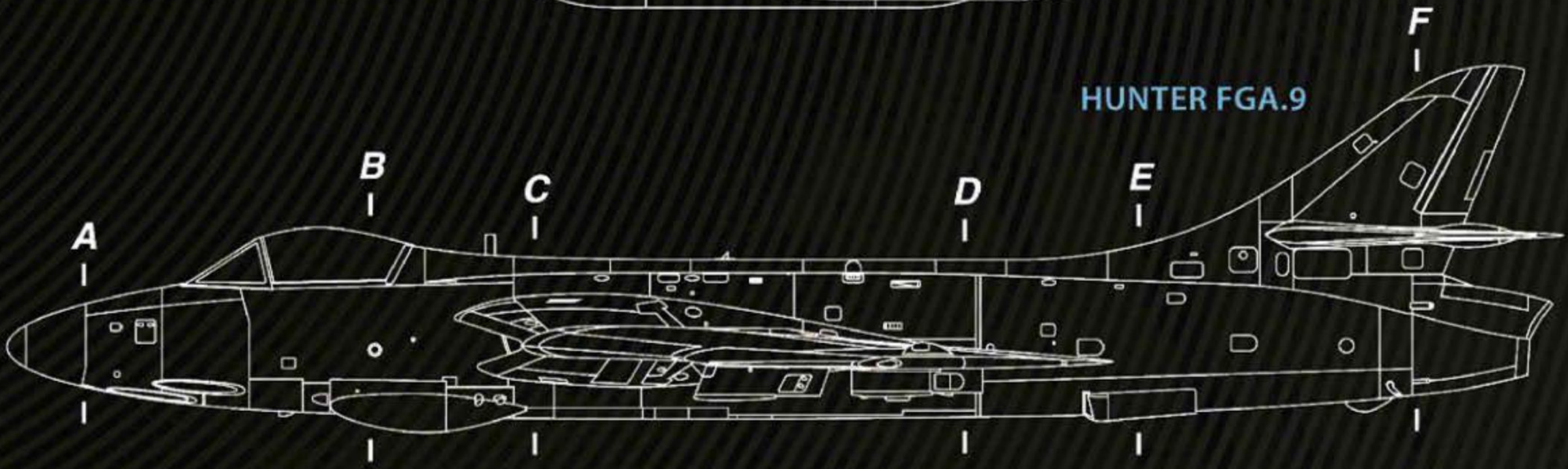
# HAWKER HUNTER

**PLANS:** 1953 - 1995




HUNTER FGA.9


HUNTER T.7


HUNTER FGA.9
A
B
C
D
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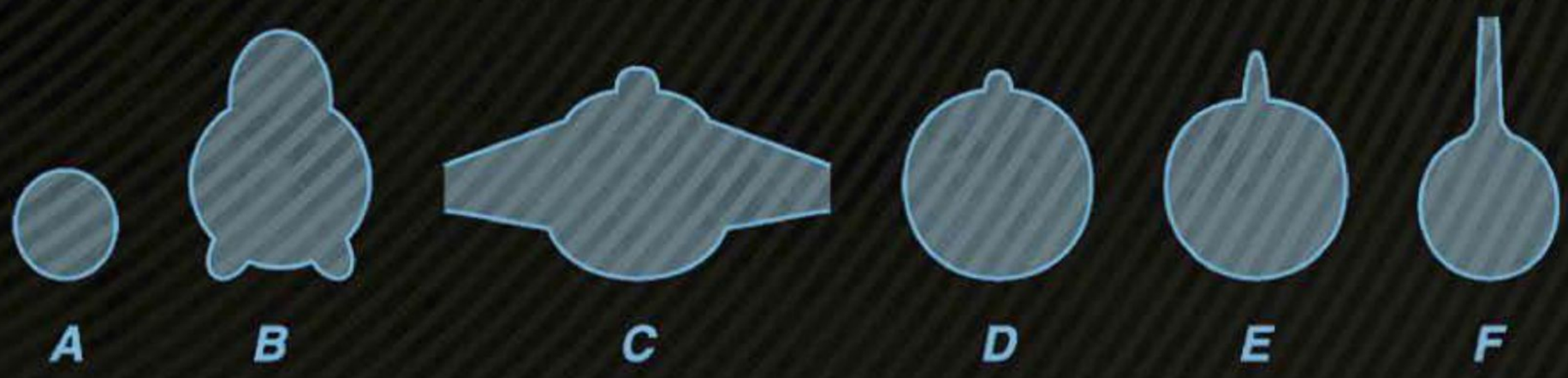
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1951-1964

**The Vickers Valiant lives in the shadow of the more successful V bombers – the Victor and Vulcan. Perhaps it is because the Valiant was only in service for a decade, whereas the Victor and Vulcan flew for far longer and became indelibly marked on the public conscious, due in part to the roles they played during the Falklands War. And one Vulcan famously remained on the display circuit until 2015.**

# VICKERS VALIANT

The odds are further stacked against the Valiant since there is only one complete surviving example left, at the RAF Museum, Cosford. Despite being side-lined, the Valiant was an essential part of Bomber Command during the late 1950s while the other V bombers were being phased in, taking on the role of nuclear deterrent for the United Kingdom as Cold War tensions escalated.

Following the Second World War, Bomber Command's heavies, the Avro Lincoln and B-29 Washington were considered obsolete due to the jet engine and the Canberra had yet to enter service. In addition, the Canberra was seen as a tactical bomber and the new heavy bombers would be utilized in a strategic role. The devastating potential of atomic bombs had been well proven and the RAF now needed a method of delivering them. This would lead to a total of four different bombers being developed and three entering service.

The first specification issued, B.14/46, was for a direct replacement for the Lincoln and was intended to cover the Shorts S.A.4 Sperrin. The Sperrin was designed to accommodate the Blue Danube bomb and seen as insurance should the more complex Avro and Handley Page designs fail to meet expectations. Shortly after this, Specification B.35/46 was issued for a bomber that could fly at Mach 0.9-1.0 and at an altitude in excess of 50,000ft, 15,240m.

Alongside the two other firms' more radical designs, Vickers tendered a four-engined high altitude bomber that was considered more aerodynamically conventional. Again, there was a pressing need for at least one of the designs to succeed. However, all three were accepted by the Air Ministry – only the 'insurance' aircraft, the Sperrin, failing to make the cut.

The original intention was for the Vickers bomber to be powered by six Napier engines but this was revised to four Avons or Sapphires mounted in the swept wing. Even at this early stage, the issue of range was considered and the most practical solution

**THE DEVASTATING POTENTIAL OF ATOMIC BOMBS HAD BEEN WELL PROVEN AND THE RAF NOW NEEDED A METHOD OF DELIVERING THEM**

# VICKERS VALIANT B.1 WP213 18 SQN

Having already served with 138 and 199 Squadrons, WP213 was with 18 Squadron from 1958 until 1962 after which it was retired. Finished in Gloss White but wearing standard national markings.

was deemed to be the fitting of external tanks. This allowed for a quick conversion where speed and weight would be offset by the range and be target dependent.

Vickers Type 660, WB210, was the first prototype to be completed and was fitted with Rolls-Royce RA.3 Avon engines. Such was the progression that it first flew from Wisley on May 18, 1951, not January 1952 as originally predicted. At the controls was J 'Mutt' Summers (who had earlier had the honour of taking the original Spitfire, K5054, on its maiden flight) and G R 'Jock' Smith was in the co-pilot's seat.

The five minute flight was uneventful and the most notable fact of the flight was that WB210 had taken off and landed on a grass runway. It did, however, leave rather large ruts and a tarmac runway was laid very soon after at Wisley.

During an intensive testing programme, WB210 was lost on January 12, 1952. While undergoing a series of engine shutdowns and relights, a failed relight led to a

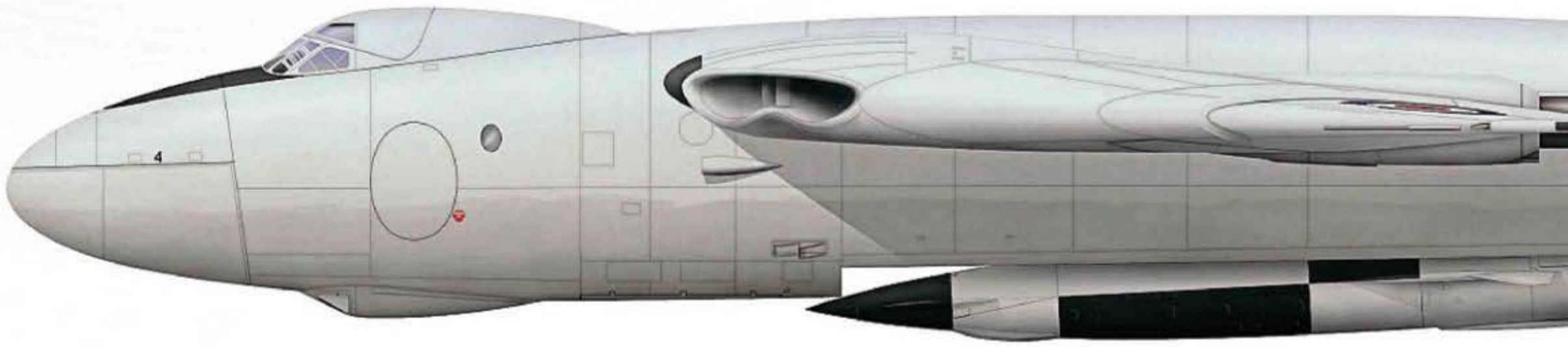
# COLD WAR JETS VICKERS VALIANT

**VICKERS VALIANT B.(K).1 XD875 138 SQN**

**Originally delivered to 207 Squadron, XD875 was flown by 138 Squadron during 1961/1962. It was subsequently written off at RAF Bruntingthorpe in November 1962. The cockpit is currently on display at the Highland Aviation Museum.**

**VICKERS VALIANT B.1 WB215**

**The second prototype built, WB215 went through several modifications during testing. Following the completion of tests it was delivered to the RAF and eventually retired in February 1961. Finished in Natural Metal.**



**138 SQUADRON BECAME THE FIRST OFFICIAL VALIANT SQUADRON, FORMING ON JANUARY 1, 1955. THAT SUMMER IT WAS RELOCATED TO WITTERING WHERE THE RAF ALREADY HAD NUCLEAR STOCKPILES**

build-up of leaked fuel near the tailpipes on the starboard side. Once it had ignited, the fire burned through a main fuel pipe before it was noticed by the crew. As they exited, the co-pilot, Sqn Ldr Brian Foster, hit the tail and later succumbed to the injuries he had suffered. The rest of the crew survived however.

With the completion of the second prototype WB215 drawing near, the loss of WB210 did not cause a major disruption to the development of the Valiant. Although it was originally intended to fit the Sapphire, WB215 actually had Avon RA.7 engines. These required a greater airflow and the intakes were modified from the elegant narrow slot sported by WB210 to something that looked more like a pair of spectacles.

Despite the revision, it was discovered that the shape could cause the engines to flame out. Experimentation with modifications to the intake using putty and fabric eventually produced a form which allowed for smooth airflow. The trials continued with a thorough testing programme, including the flight envelope and bombing systems.

WJ954 was the third Valiant completed. It was the only B.2 built and was used to explore the potential of the type. It was proposed that the B.2 would have a crew of just two, 20% greater range and a higher cruising speed as a result of the Conway engines. Its primary role was as a target indicator but it was also to fulfil a secondary role in photo reconnaissance.

By the time WJ954 flew on September 4, 1953, that role was deemed unnecessary and the order was cancelled. In an all-over Gloss Black, it did however support the development of the B.1. Following a landing accident, WJ954 was unceremoniously destroyed at Foulness in 1958 where it was used to test the effects of various projectiles on an airframe.

The Valiant which entered service differed very little from the second prototype. There

were some internal differences and the Avon RA.14 was fitted in place of the RA.7 but it was essentially the same. In order to train crews who had previously flown the Lancaster and Lincoln, 232 Operational Conversion Unit was formed at RAF Gaydon in 1954. It also catered for ground crew and engineers, introducing them to the new technology.

Due to the costs of the new aircraft and the responsibility involved in potentially carrying out a nuclear strike, V force crews had to meet certain criteria. Early captains had to have a minimum of 1750 hours as a captain, to have completed a full tour on the Canberra and preferably to have experience of a four-engined postwar 'heavy'.

Second pilots also had to have completed a Canberra tour and have a minimum of 700 hours as captain. While there were later changes to the requirement of piston experience, the high standards were continued and applied to the selection process for Victor and Vulcan crews.

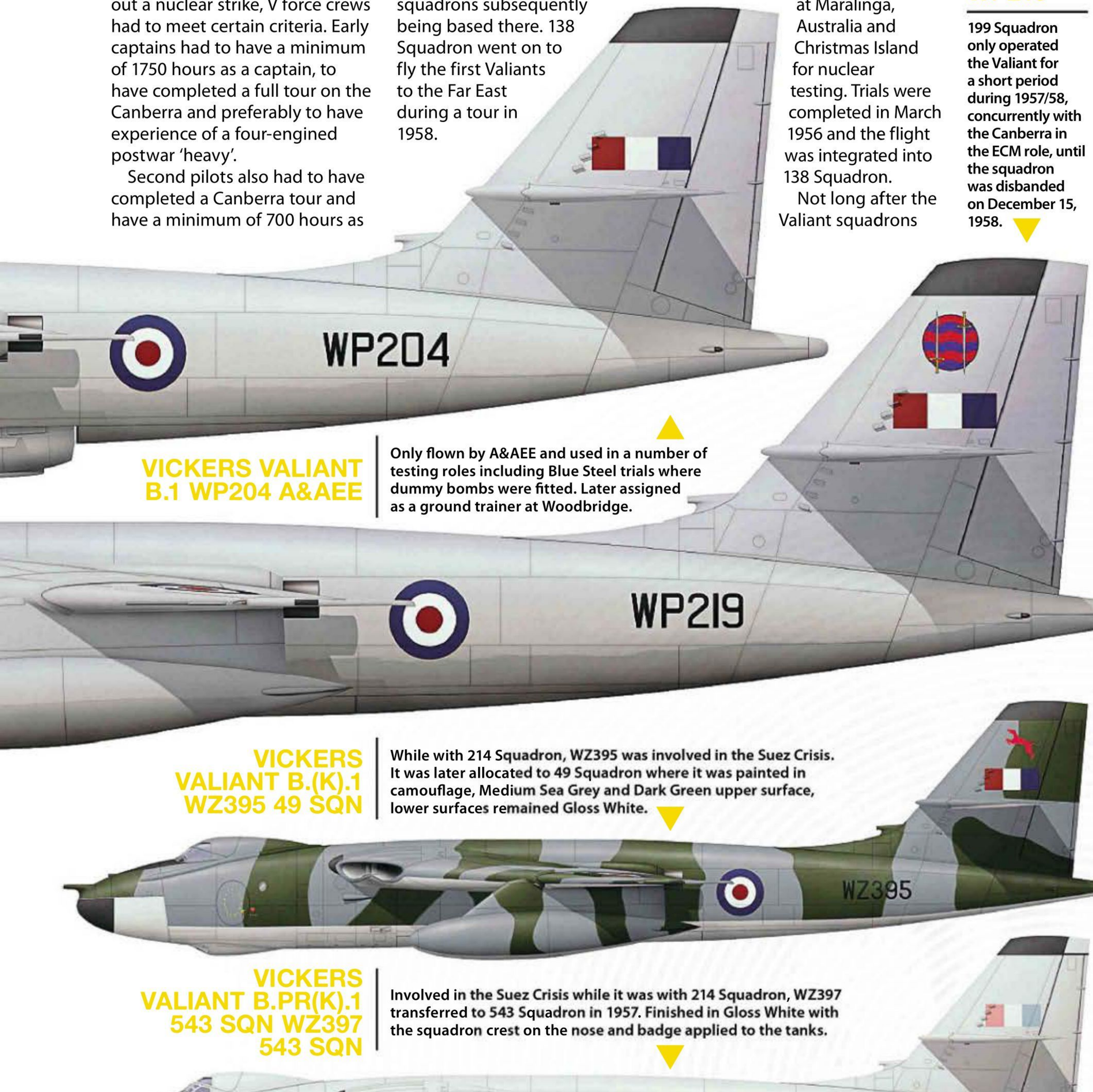
138 Squadron became the first official Valiant squadron, forming on January 1, 1955. That summer it was relocated to Wittering where the RAF already had nuclear stockpiles. Wittering was a key V force base during the Cold War, Victor and Vulcan squadrons subsequently being based there. 138 Squadron went on to fly the first Valiants to the Far East during a tour in 1958.

As the aircraft rolled off the production line and crews were trained, nine more Valiant squadrons were formed over the next two years. These included C Flight of 199 Squadron (the other flights operating the Canberra) where it was used for ECM training. 1321 Flight was also re-formed for the explicit purpose of undertaking Blue Danube trials with the Valiant. Based at Wittering, it used Orford Ness for dummy drops and ranges at Maralinga, Australia and Christmas Island for nuclear testing. Trials were completed in March 1956 and the flight was integrated into 138 Squadron.

Not long after the Valiant squadrons

## VICKERS VALIANT B.(PR).1 199 SQN WP219

**199 Squadron only operated the Valiant for a short period during 1957/58, concurrently with the Canberra in the ECM role, until the squadron was disbanded on December 15, 1958.**




## VICKERS VALIANT B.1 WP204 A&AEE

**Only flown by A&AEE and used in a number of testing roles including Blue Steel trials where dummy bombs were fitted. Later assigned as a ground trainer at Woodbridge.**

## VICKERS VALIANT B.(K).1 WZ395 49 SQN

**While with 214 Squadron, WZ395 was involved in the Suez Crisis. It was later allocated to 49 Squadron where it was painted in camouflage, Medium Sea Grey and Dark Green upper surface, lower surfaces remained Gloss White.**




## VICKERS VALIANT B.PR(K).1 543 SQN WZ397 543 SQN

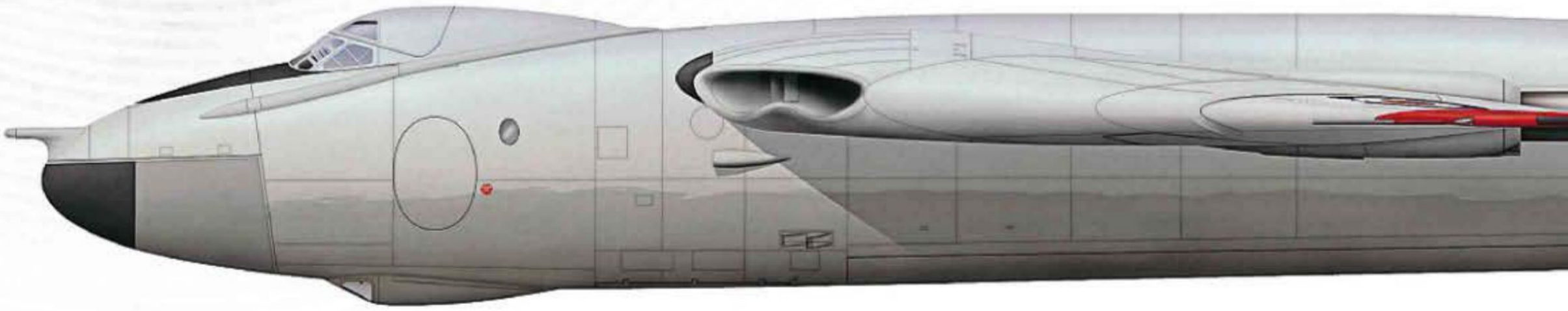
**Involved in the Suez Crisis while it was with 214 Squadron, WZ397 transferred to 543 Squadron in 1957. Finished in Gloss White with the squadron crest on the nose and badge applied to the tanks.**

had formed, they were involved in the Suez Crisis. 138, 148, 207 and 214 squadrons sent a total of 24 Valiants to RAF Luqa, Malta, to support the British operation. Range was not an issue for the type and bombing commenced on October 31, 1956. The target was Almaza Airfield. As the campaign continued, 49 sorties were flown by the Valiants.

The bomber could also undertake a secondary role by fitting a photographic pack in the bomb bay and several aircraft were adapted to accommodate this equipment. Two B(PR).1s of 543 Squadron were put to good use after British Honduras had suffered a severe hurricane. Based at Jamaica they were used to assess the damage and support the aid operation.

Just like the other V bombers, Valiants were also adapted to fly as tankers. Unlike the other two bombers however, the conversion for the Valiant was simple. As with the PR pack, a unit encompassing a fuel tank and drogue could be fitted in the bomb bay. The B.2, WJ954, was the first to receive this conversion and used for trials in 1953 not too long after its first flight. So successful was the refuelling that Valiants were involved in the first long range refuelling exercise when they supported four Javelins which were needed urgently to reinforce British Forces in the Far East during October 1960.

These roles, while valuable and making good use of the Valiant, were not the primary roles for which it was commissioned. The Valiant was designed as a nuclear

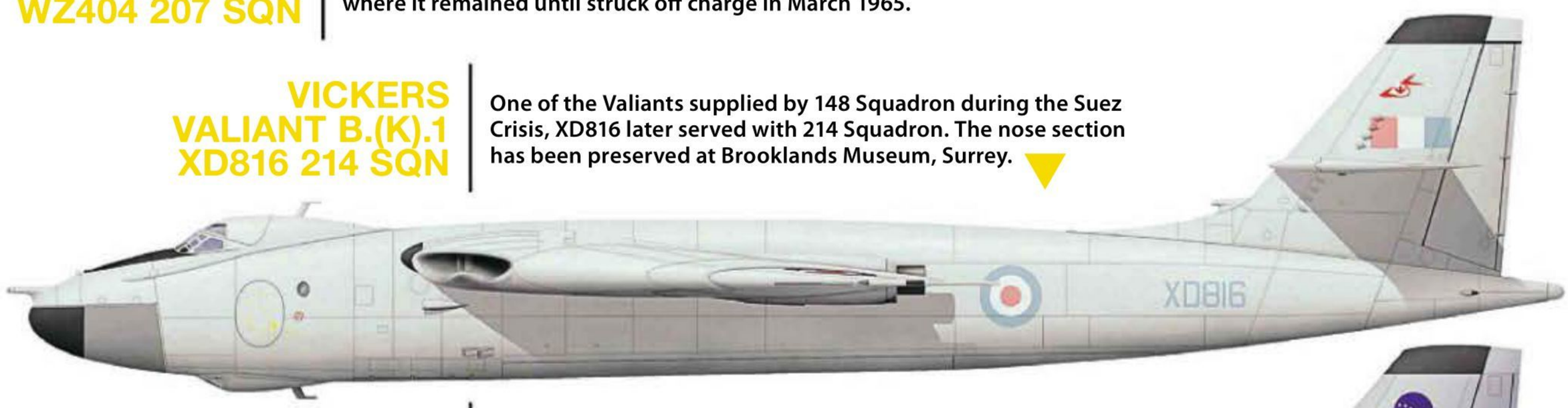


**VICKERS VALIANT B.(K).1 WZ404 207 SQN**

**Wearing the late camouflage scheme, WZ404 was delivered to 230 OCU in July 1956 but shortly after allocated to 207 Squadron where it remained until struck off charge in March 1965.**

**VICKERS VALIANT B.(K).1 XD816 214 SQN**

**One of the Valiants supplied by 148 Squadron during the Suez Crisis, XD816 later served with 214 Squadron. The nose section has been preserved at Brooklands Museum, Surrey.**




**VICKERS VALIANT B.1 XD826 7 SQN**

**Delivered in January 1957 to 7 Squadron with national markings and the squadron badge applied to the tail, XD826 went on to serve with several other squadrons. The nose was retained as a ground trainer and has been preserved.**

deterrent. It did drop many live bombs during the postwar years but only during tests, when various a weapons were being developed. Valiant WZ366 was responsible for dropping the first British atomic bomb (a Blue Danube) at Marlinga, Australia, on October 11, 1956.

Valiants continued to be involved in the atomic warfare programme for many years, ranging from further live tests to aerodynamic trials of the Blue Steel missile.

Following the shooting down of a U2 by a Soviet SAM in 1960 there was a radical change to bombing methods. Prior to this event, bombers were considered safely out of range of any threat at high altitude. To evade enemy defences a switch to low level was made, but this put a lot more stress on the airframe due to the higher level of manoeuvres required when following the terrain.

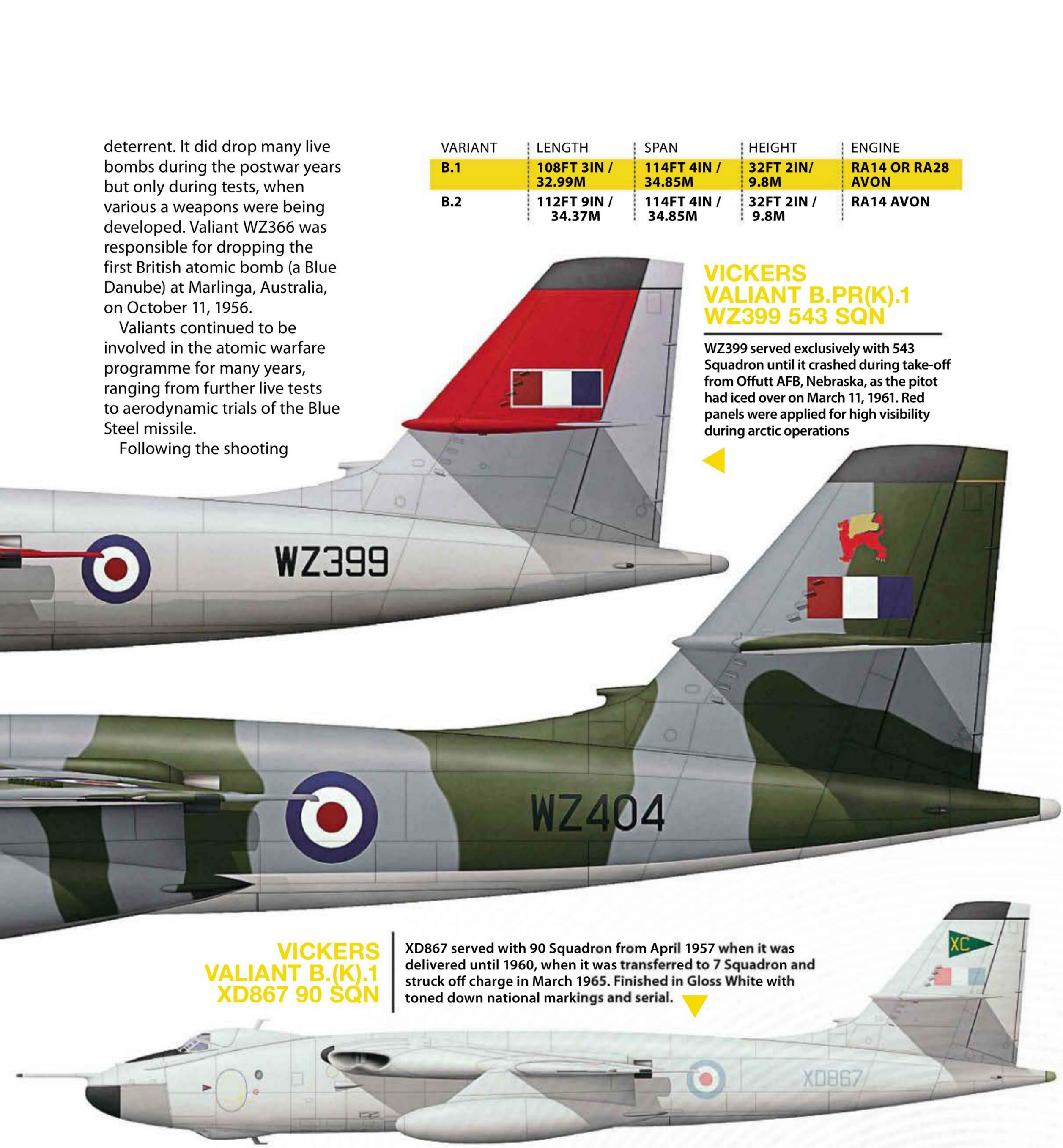
This strain revealed an inherent weakness in the construction of the Valiant and during 1964 several suffered cracks in the rear wing spar. Despite some repairs to aircraft, the fleet was grounded and by January 1965 the Ministry of Defence had decided it was too costly. With the Victors and Vulcans still in service the Valiant was considered surplus to requirements.

The Valiant was only ever intended as the safe option compared to the more advanced and then unproven designs of the other V bombers but during almost 10 years of service it fulfilled a wide range of roles from being a test bed for the Pegasus engine which ended up in the Harrier to being at the forefront of the atomic age. Despite such a vital contribution only one complete Valiant survives at RAF Cosford.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| **B.1** | **108FT 3IN / 32.99M** | **114FT 4IN / 34.85M** | **32FT 2IN/ 9.8M** | **RA14 OR RA28 AVON** |
| **B.2** | **112FT 9IN / 34.37M** | **114FT 4IN / 34.85M** | **32FT 2IN / 9.8M** | **RA14 AVON** |

## VICKERS VALIANT B.PR(K).1 WZ399 543 SQN

**WZ399 served exclusively with 543 Squadron until it crashed during take-off from Offutt AFB, Nebraska, as the pitot had iced over on March 11, 1961. Red panels were applied for high visibility during arctic operations**




## VICKERS VALIANT B.(K).1 XD867 90 SQN

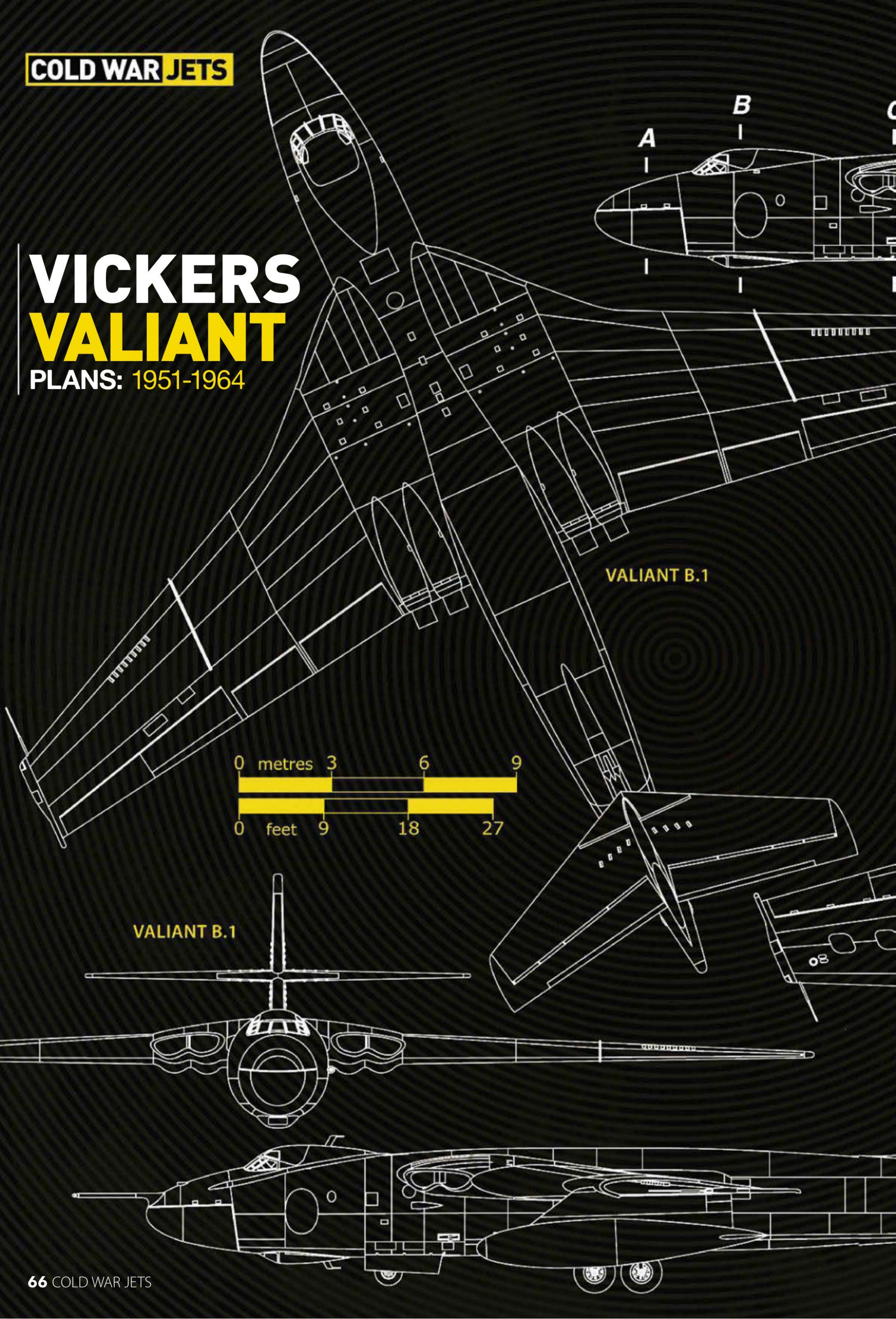
**XD867 served with 90 Squadron from April 1957 when it was delivered until 1960, when it was transferred to 7 Squadron and struck off charge in March 1965. Finished in Gloss White with toned down national markings and serial.**




**VALIANT WZ366 WAS RESPONSIBLE FOR DROPPING THE FIRST BRITISH ATOMIC BOMB (A BLUE DANUBE) AT MARLINGA, AUSTRALIA, ON OCTOBER 11, 1956**

# VICKERS VALIANT

**PLANS:** 1951-1964



C

D

E

VALIANT B.1

A

MAIN WHEEL

B

VALIANT B.1

C

D

E

VALIANT B.1

# GLOSTER JAVELIN

1951-1975

**The Javelin is one of the forgotten warriors of the Cold War. A total of 436 were built but it only remained in front line service for 12 years and just a single aircraft continued to fly until 1975. This could explain why the aircraft has been very much overshadowed by other longer serving aircraft.**

What should not be forgotten is how much of an advance the Javelin represented compared to the Vampire and Meteor night fighters it was replacing, especially when later variants were fitted with Firestreak missiles and the Sapphire engine to create a formidable all weather fighter.

The order for the aircraft that was to eventually become the Javelin was issued when the de Havilland Mosquito was still employed as night fighter with several squadrons. As engine development advanced it was clear that a much more capable replacement would be required.

The short term solution was to adapt Meteors and Vampires for the role but a dedicated aircraft would still be needed. With this in mind, specifications F.43/46 and F.44/46 were issued for a day and night fighter respectively, subsequent specifications refined the requirement but these were to lay the foundation for what would eventually be the Javelin.

Early concepts involved modifications to Gloster's existing Meteor design but these slowly evolved into a delta wing aircraft with a delta tail unit too, and the engines were moved into the fuselage. Even during the early stages

of the project the Armstrong Siddeley Sapphire was the preferred power choice.

There was considerable indecision at the Ministry of Supply over the preferred armament however. At one stage it was thought that no guns should be fitted, with the fighter relying wholly on the Red Hawk AAM. Once an official order had been raised for the type, work commenced on the Gloster GA.5 and WD804 took to the air on November 26, 1951, with Gloster chief test pilot 'Bill' Waterton at the controls.

Early flights highlighted a number of issues with the design, such as buffeting and vibration caused by the exhaust. This was overcome with a pen-nib style fairing that was fitted to early variants. There was also a significant setback to the testing programme on June 29, 1952, when severe flutter caused the elevators to detach in flight.

Waterton attempted a landing at Boscombe Down but a combination of the high-speed approach and wind conditions led to the port undercarriage puncturing a fuel tank and causing a fire. The loss of WD804 did not deter the Ministry however, and the aircraft was selected to go into production (an order for 200 was placed). The DH.110, which was a direct competitor, was dropped but interest had been shown by the

**EARLY FLIGHTS HIGHLIGHTED A NUMBER OF ISSUES WITH THE DESIGN**

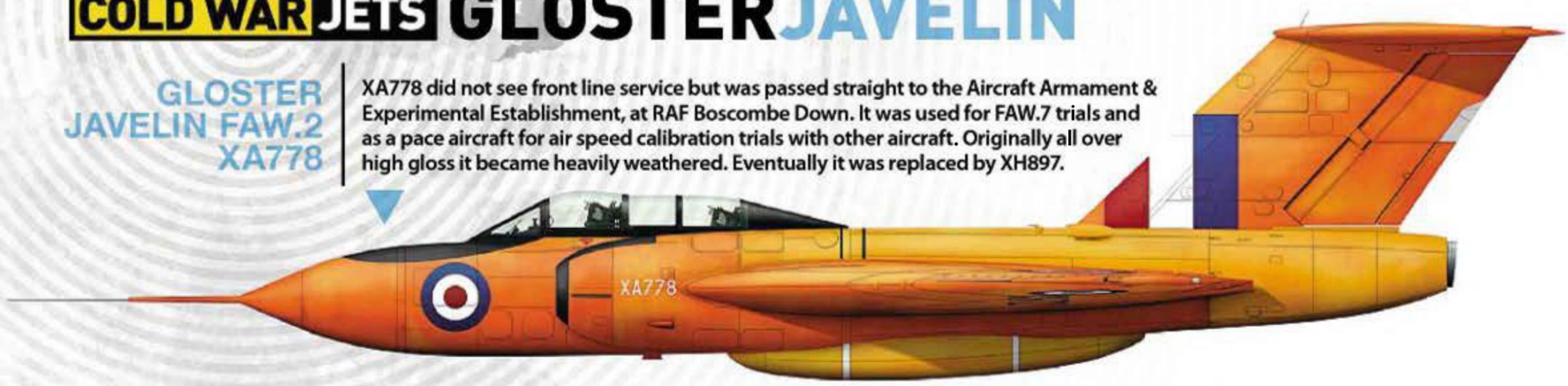
## GLOSTER JAVELIN FAW.9 XH903 33 SQN

**Originally built as a FAW.7 in 1954, it was upgraded to FAW.9 and returned 33 Squadron in January 1961. It was then loaned to 29 Squadron before being eventually struck off charge on December 2, 1967, and is now in the Jet Age Museum collection.**

# COLD WAR JETS GLOSTER JAVELIN

## GLOSTER JAVELIN FAW.2 XA778

XA778 did not see front line service but was passed straight to the Aircraft Armament & Experimental Establishment, at RAF Boscombe Down. It was used for FAW.7 trials and as a pace aircraft for air speed calibration trials with other aircraft. Originally all over high gloss it became heavily weathered. Eventually it was replaced by XH897.




Royal Navy and it ended up in service as the Sea Vixen. In August a name for the GA.5 was finally selected, in contention was 'Spearhead' but Javelin was the preferred choice.

More prototypes were constructed so that testing could continue and WD808 took to the air on August 20, 1952. As the programme continued there were a stream of revisions and alterations to the Javelin.

A bulge was required in the canopy to accommodate the crew and their helmets comfortably, from the fifth prototype it was also split into two, replacing the original single unit.

As with the Vulcan delta bomber, a straight leading edge resulted in high-speed, high altitude handling issues. The solution for both aircraft was to introduce a kink and in the case of the Javelin the outer leading edge saw a reduction in the angle of sweep.

By the summer of 1954, manufacture of the FAW.1 was progressing well and the first Mk.I, XA544, flew on July 22, 1954, but it was not until February 24, 1956, following RAF trials, that a Javelin finally reached a front line squadron – 46 Squadron receiving XA570 at RAF Odiham. The factory was producing on average 4.5

## GLOSTER JAVELIN FAW.4 XA632 11 SQN

First delivered to 11 Squadron in March 1956 while at RAF Geilenkirchen, West Germany. Flown as 'A'. At this time the squadron decorated the tail code with their colours instead of the squadron badge which replaced it. XA632 was retired and stored at RAF Shawbury in August 1962.

## GLOSTER JAVELIN FAW.5 XA654 72 SQN

ronXA654 was first operated by 23 Squadron before being passed on to 72 Squadron, while they were based at RAF Leconfield. The aircraft remained on strength until the squadron was temporarily disbanded in June 1961.

## GLOSTER JAVELIN FAW.4 XA730 23 SQN

Operated by 23 Squadron, based at RAF Horsham-Saint Faith where it wore the early simple squadron badge in solid red on the tail. XA730 later served with 72 Squadron.

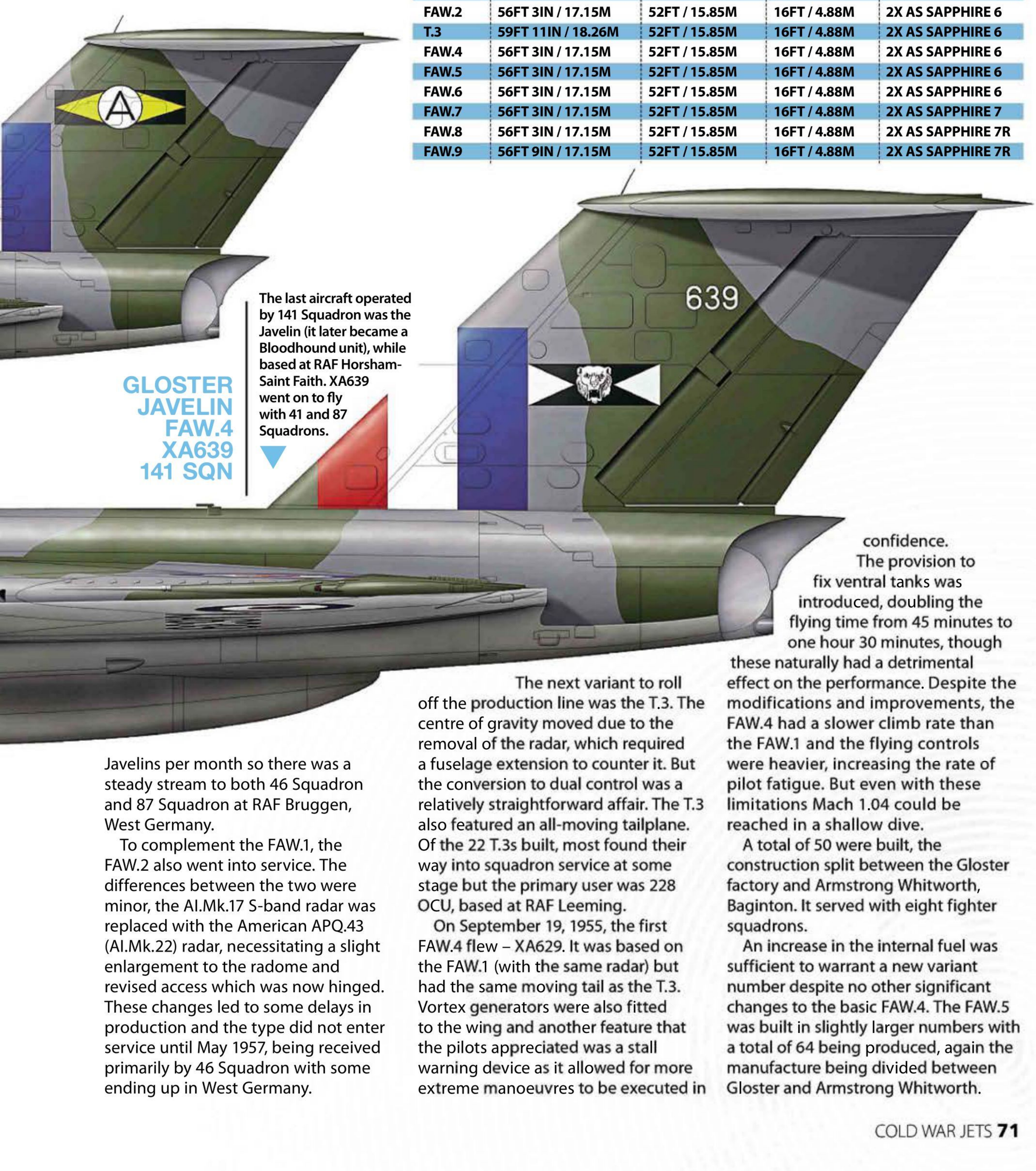
## GLOSTER JAVELIN FAW.4 XA638 3 SQN

**3 Squadron Javelin, based at RAF Geilenkirchen, West Germany, with the code J on the tail. XA638 had served with both 141 and 41 Squadrons prior to 3 Squadron. After only a little more than three years in service it was retired in January 1961 and scrapped the following year.**

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| **FAW.1** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **FAW.2** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **T.3** | **59FT 11IN / 18.26M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **FAW.4** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **FAW.5** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **FAW.6** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 6** |
| **FAW.7** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 7** |
| **FAW.8** | **56FT 3IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 7R** |
| **FAW.9** | **56FT 9IN / 17.15M** | **52FT / 15.85M** | **16FT / 4.88M** | **2X AS SAPPHIRE 7R** |

## GLOSTER JAVELIN FAW.4 XA639 141 SQN

**The last aircraft operated by 141 Squadron was the Javelin (it later became a Bloodhound unit), while based at RAF Horsham-Saint Faith. XA639 went on to fly with 41 and 87 Squadrons.**




Javelins per month so there was a steady stream to both 46 Squadron and 87 Squadron at RAF Bruggen, West Germany.

To complement the FAW.1, the FAW.2 also went into service. The differences between the two were minor, the AI.Mk.17 S-band radar was replaced with the American APQ.43 (AI.Mk.22) radar, necessitating a slight enlargement to the radome and revised access which was now hinged. These changes led to some delays in production and the type did not enter service until May 1957, being received primarily by 46 Squadron with some ending up in West Germany.

The next variant to roll off the production line was the T.3. The centre of gravity moved due to the removal of the radar, which required a fuselage extension to counter it. But the conversion to dual control was a relatively straightforward affair. The T.3 also featured an all-moving tailplane. Of the 22 T.3s built, most found their way into squadron service at some stage but the primary user was 228 OCU, based at RAF Leeming.

On September 19, 1955, the first FAW.4 flew – XA629. It was based on the FAW.1 (with the same radar) but had the same moving tail as the T.3. Vortex generators were also fitted to the wing and another feature that the pilots appreciated was a stall warning device as it allowed for more extreme manoeuvres to be executed in confidence.

The provision to fix ventral tanks was introduced, doubling the flying time from 45 minutes to one hour 30 minutes, though these naturally had a detrimental effect on the performance. Despite the modifications and improvements, the FAW.4 had a slower climb rate than the FAW.1 and the flying controls were heavier, increasing the rate of pilot fatigue. But even with these limitations Mach 1.04 could be reached in a shallow dive.

A total of 50 were built, the construction split between the Gloster factory and Armstrong Whitworth, Baginton. It served with eight fighter squadrons.

An increase in the internal fuel was sufficient to warrant a new variant number despite no other significant changes to the basic FAW.4. The FAW.5 was built in slightly larger numbers with a total of 64 being produced, again the manufacture being divided between Gloster and Armstrong Whitworth.

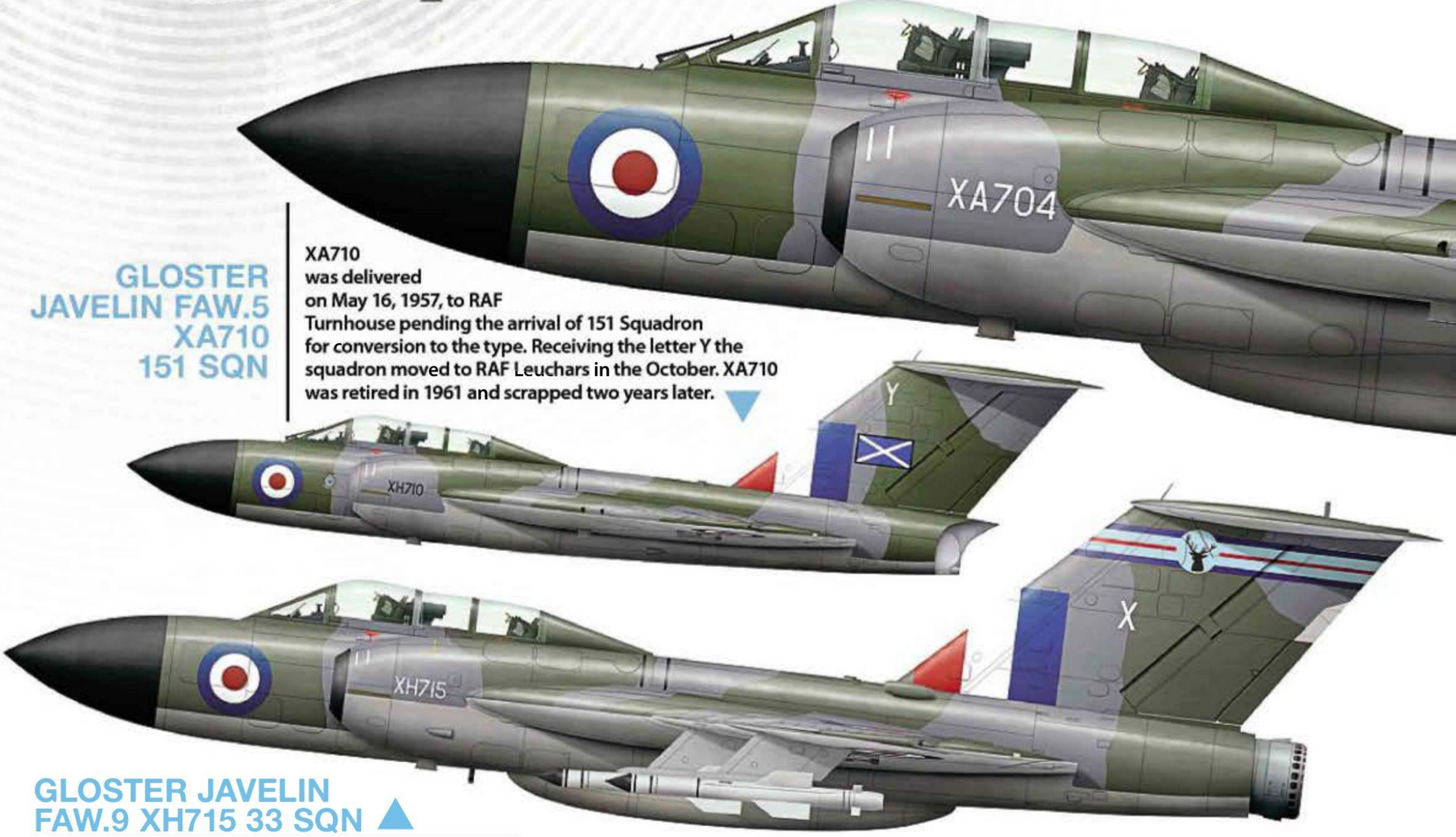
# GLOSTER JAVELIN

## GLOSTER JAVELIN FAW.5 XA666 41 SQN

While primarily operating first the Javelin FAW.4 and later FAW.8, 41 Squadron did have other types including XA666 which was first used by 228 Operational Conversion Unit and following a period with 41 Squadron, while at RAF Coltishall, it was then passed on to 5 Squadron.

## GLOSTER JAVELIN FAW.5 XA710 151 SQN

XA710 was delivered on May 16, 1957, to RAF Turnhouse pending the arrival of 151 Squadron for conversion to the type. Receiving the letter Y the squadron moved to RAF Leuchars in the October. XA710 was retired in 1961 and scrapped two years later.




## GLOSTER JAVELIN FAW.9 XH715 33 SQN

Delivered to 33 Squadron at RAF Middleton-Saint George, as a FAW.7 on June 6, 1958, XH715 received the code A. In 1961 it was converted to a FAW.9, received the code X and was retained by 33 Squadron.

## GLOSTER JAVELIN FAW.7 XH835 33 SQN

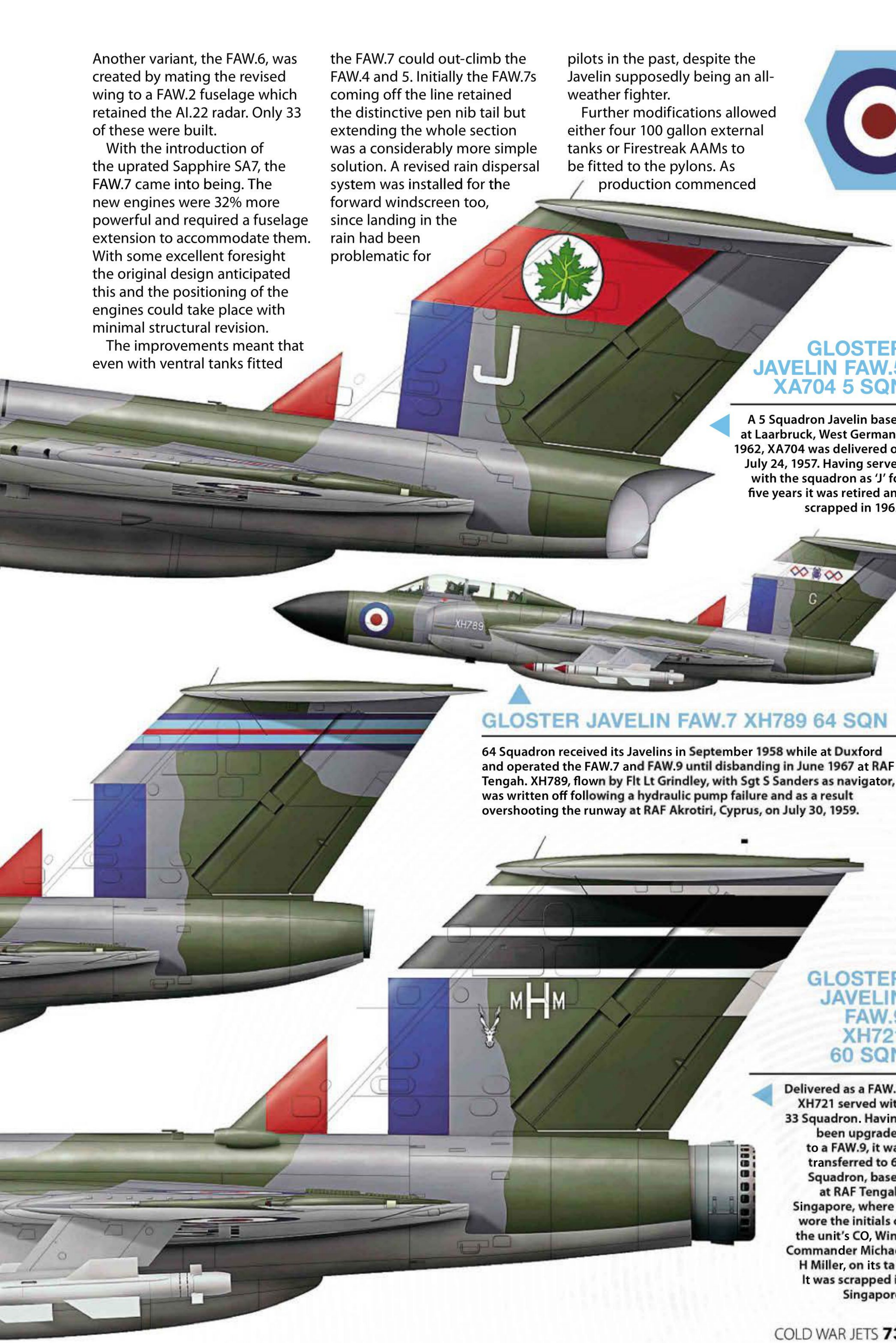
Flown by 33 Squadron's commanding officer, Wing Commander N Pool, XH835 carries his initials. On squadron strength while based at RAF Middleton Saint George, County Durham between 1958 and 1962.

Another variant, the FAW.6, was created by mating the revised wing to a FAW.2 fuselage which retained the AI.22 radar. Only 33 of these were built.

With the introduction of the uprated Sapphire SA7, the FAW.7 came into being. The new engines were 32% more powerful and required a fuselage extension to accommodate them. With some excellent foresight the original design anticipated this and the positioning of the engines could take place with minimal structural revision.

The improvements meant that even with ventral tanks fitted the FAW.7 could out-climb the FAW.4 and 5. Initially the FAW.7s coming off the line retained the distinctive pen nib tail but extending the whole section was a considerably more simple solution. A revised rain dispersal system was installed for the forward windscreen too, since landing in the rain had been problematic for pilots in the past, despite the Javelin supposedly being an all-weather fighter.

Further modifications allowed either four 100 gallon external tanks or Firestreak AAMs to be fitted to the pylons. As production commenced




## GLOSTER JAVELIN FAW.5 XA704 5 SQN

A 5 Squadron Javelin based at Laarbruck, West Germany, 1962, XA704 was delivered on July 24, 1957. Having served with the squadron as 'J' for five years it was retired and scrapped in 1965.

## GLOSTER JAVELIN FAW.7 XH789 64 SQN

64 Squadron received its Javelins in September 1958 while at Duxford and operated the FAW.7 and FAW.9 until disbanding in June 1967 at RAF Tengah. XH789, flown by Flt Lt Grindley, with Sgt S Sanders as navigator, was written off following a hydraulic pump failure and as a result overshooting the runway at RAF Akrotiri, Cyprus, on July 30, 1959.

## GLOSTER JAVELIN FAW.9 XH721 60 SQN

Delivered as a FAW.7, XH721 served with 33 Squadron. Having been upgraded to a FAW.9, it was transferred to 60 Squadron, based at RAF Tengah, Singapore, where it wore the initials of the unit's CO, Wing Commander Michael H Miller, on its tail. It was scrapped in Singapore.

# COLD WAR JETS GLOSTER JAVELIN

## GLOSTER JAVELIN FAW.9 XH764 29 SQN

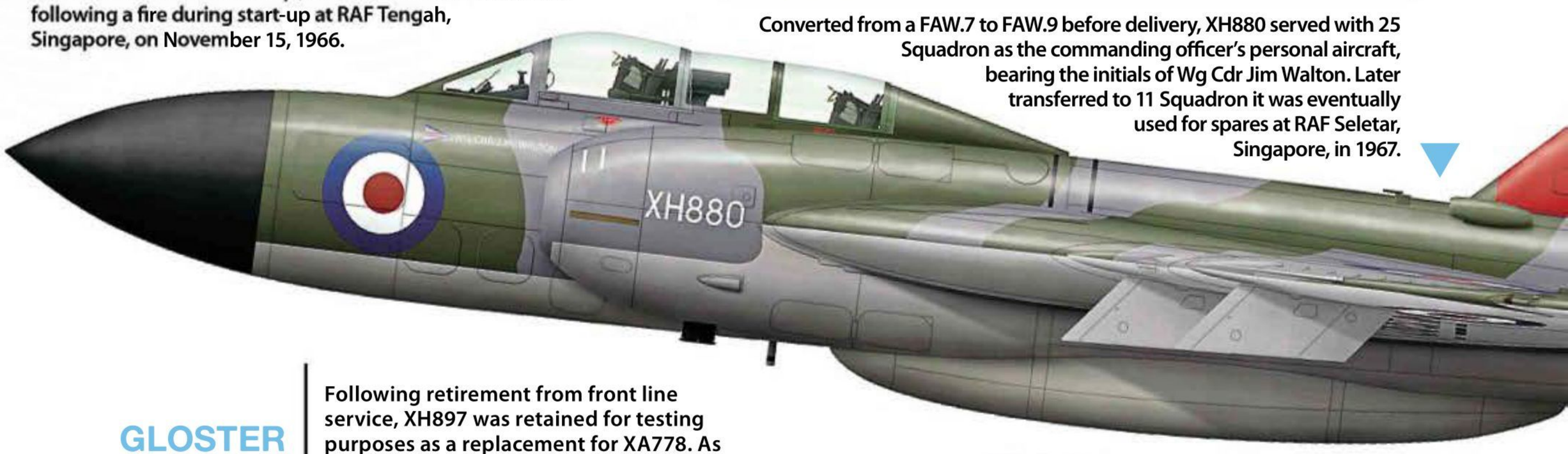
XH764 was flown by 29 Squadron, which converted to the Javelin in 1957 and operated the type for a decade. Having been retired, XH764 was on a ferry flight pending disposal when it suffered a heavy landing at RAF Manston and was written off. Later it became the gate guardian at RAF Manston before being scrapped in 1990. While on display it was painted to represent XA639 of 87 Squadron.

## GLOSTER JAVELIN FAW.9 XH885 23 SQN

A 23 Squadron Javelin with long range refuelling probe fitted while on detachment to Luqa, Malta. XH885 was written off following a fire during start-up at RAF Tengah, Singapore, on November 15, 1966.

## GLOSTER JAVELIN FAW.9 XH880 25 SQN

Converted from a FAW.7 to FAW.9 before delivery, XH880 served with 25 Squadron as the commanding officer's personal aircraft, bearing the initials of Wg Cdr Jim Walton. Later transferred to 11 Squadron it was eventually used for spares at RAF Seletar, Singapore, in 1967.




## GLOSTER JAVELIN FAW.9 XH897

Following retirement from front line service, XH897 was retained for testing purposes as a replacement for XA778. As part of the A&AEE the standard camouflage scheme was replaced with the high visibility scheme. On January 24, 1975, it was finally retired to IWM Duxford where it is still on display.

the missile system had yet to be completed and it was retrofitted to the first 30 FAW.7s.

A revised control panel was fitted to allow for the fire control system needed to operate the Firestreak missiles. So successful was this iteration of the Javelin that 142 were built in total.

The last version was the FAW.8 which saw the introduction of reheat to the Sapphire SA7 and an increase in thrust by a further 12%. The improvement in performance was such that 116 FAW.7s were later converted (including the wing modification) and designated the FAW.9. This alteration was the most noticeable external change to the Javelin with the system extending the external tailpipes, which included the reheat pipes. There were alterations to the leading edge as well.

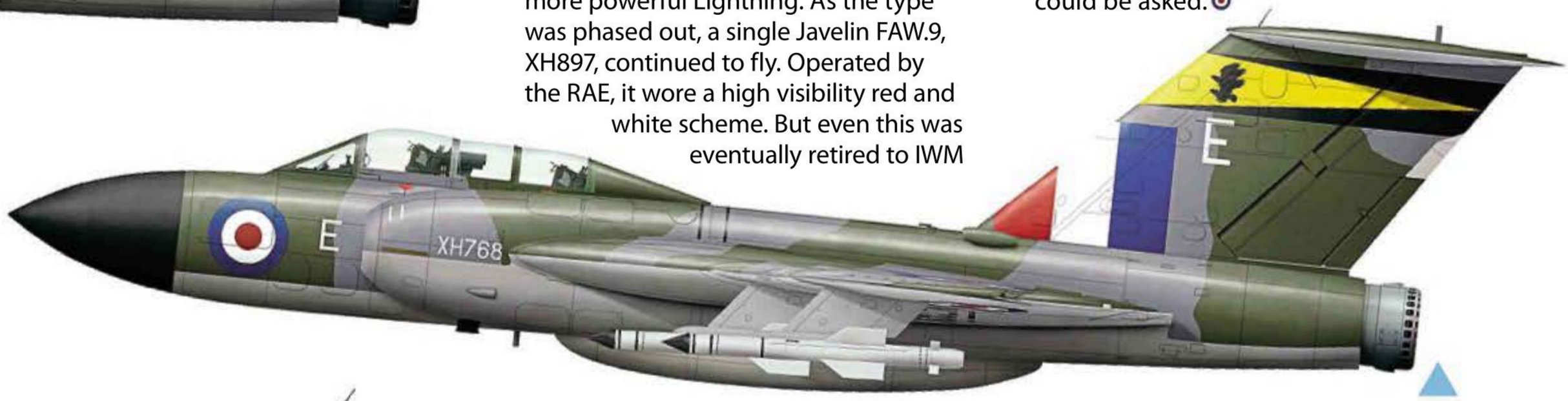
The FAW.8 had the same radar as the Mk.2 and Mk.6, the AI.22. An initial order for 60 FAW.8s was placed but the order for the last 13 was rescinded, the airframes at various stages of construction being used for spares.

Javelins were operated by the

RAF throughout the world in various hotspots and were a constant presence in West Germany. During the Malayan crisis of 1964, a 60 Squadron Javelin forced an Indonesian C-130 to crash, this being the only air-to-air victory by the type.

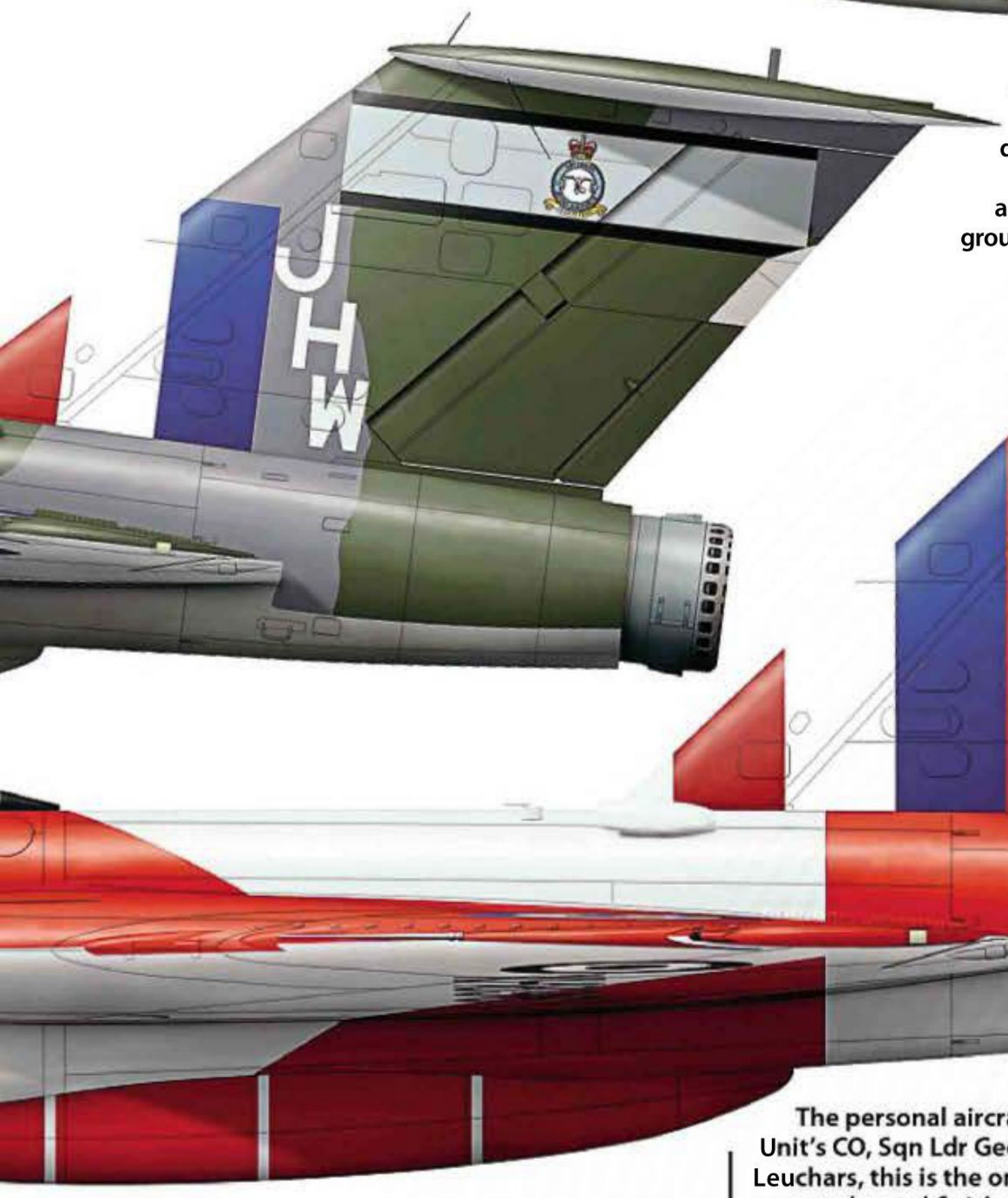
As the squadron pulled out, several Javelins were left as instructional airframes and had the national markings painted over. For many years the Javelin also defended British airspace from Soviet probes and remained on constant alert until it was replaced by the much more powerful Lightning. As the type was phased out, a single Javelin FAW.9, XH897, continued to fly. Operated by the RAE, it wore a high visibility red and white scheme. But even this was eventually retired to IWM Duxford on January 24, 1975.

As the first dedicated all-weather jet fighter, and given the success of other British jets, it might be expected that the Javelin found air forces across the globe eager to buy it, but this was not the case. Interest was expressed by Austria and Belgium, but with a plethora of other jets now in production and development – some of which were much more flexible in other roles – no sales materialised. During its time in service, the Javelin was respected and appreciated by its pilots and did what was required so no more could be asked.




## GLOSTER JAVELIN FAW.9 XH768 11 SQN

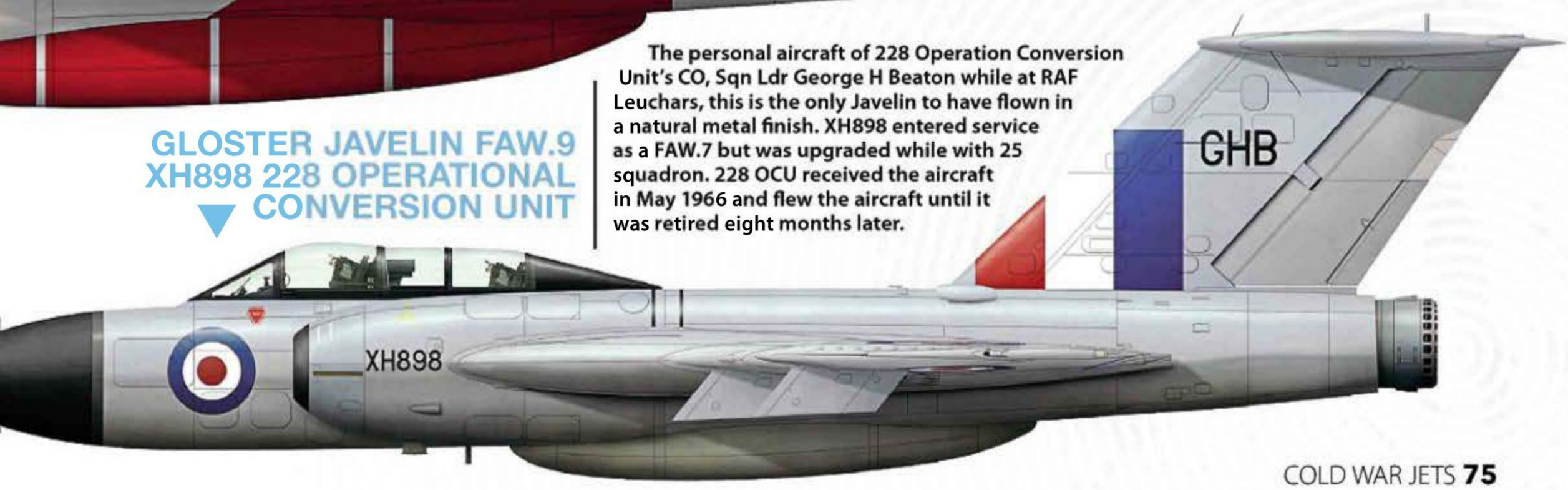
**Originally constructed as a FAW.7 but converted to FAW.9 standard before delivery to the RAF, XH768 first served with 25 Squadron with the code E. It was then transferred to 11 Squadron at RAF Geilenkirchen, West Germany, and retained the tail code. Following a period with 29 Squadron it was used as a ground trainer. It is currently on display at Cerbaiola, Italy, wearing the code HX707.**




**RESPECTED AND APPRECIATED BY ITS PILOTS AND DID WHAT WAS REQUIRED**

## GLOSTER JAVELIN FAW.9 XH898 228 OPERATIONAL CONVERSION UNIT

**The personal aircraft of 228 Operation Conversion Unit's CO, Sqn Ldr George H Beaton while at RAF Leuchars, this is the only Javelin to have flown in a natural metal finish. XH898 entered service as a FAW.7 but was upgraded while with 25 squadron. 228 OCU received the aircraft in May 1966 and flew the aircraft until it was retired eight months later.**



# GLOSTER JAVELIN

**PLANS:** 1951–1975

FRONT WHEEL

0 meters 2 4 6

0 feet 6 12 18

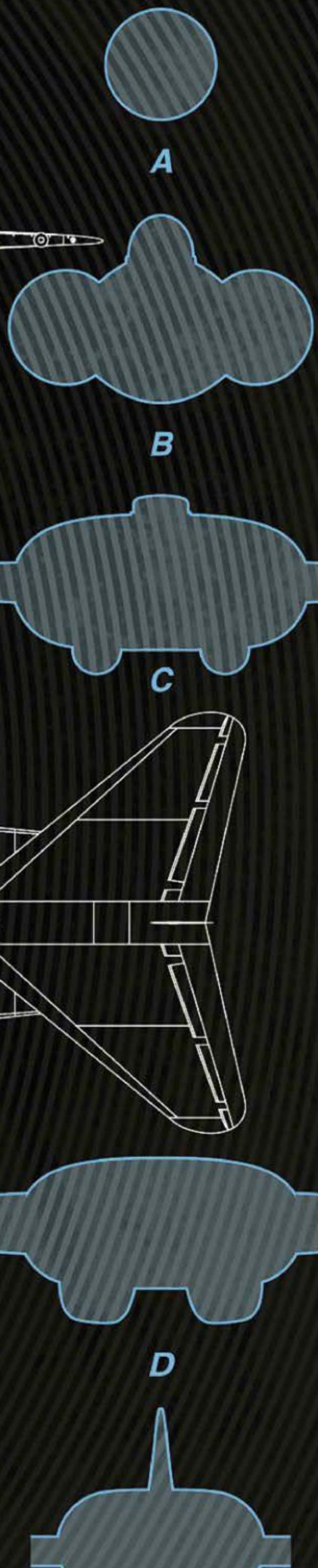
JAVELIN FAW.9

JAVELIN FAW.9

MAIN WHEEL

A B C D E

JAVELIN FAW.9




JAVELIN FAW.9

# HANDLEY PAGE VICTOR

1952-1993

**The Vulcan may have beaten the Victor into the air by only four months but the Victor remained in service for nearly a decade longer in the secondary role of tanker, in which guise it made a valuable contribution during two conflicts. Like the Vulcan, the Victor was way ahead of its time in terms of design and expectations of performance, the low crescent wings and smooth intakes giving the Victor a futuristic look even in the 21st century.**

Details of Specification B.35/46 have been covered in the Valiant section and Handley Page's proposal was the HP.80. The specification had been anticipated by Sir Frederick Handley Page in 1945 when he became aware of the contract issued to English Electric for a jet powered bomber (the Canberra). He instructed the design team at Handley Page to start investigating both a two engined bomber and a larger four engined aircraft. Research by company aerodynamicist Dr Gustav Lachmann suggested that a swept crescent style wing would be suitable for the near Mach speeds the HP.80 would reach.

Much of the research that led to the HP.80 came from the HP.75 Manx which had been built by a subcontractor Dart Aircraft Limited. It was commissioned in 1937 and delivered in 1939 but due to the war did not fly until June 11, 1943. The research gathered convinced the design team that scaling up the concept would be feasible and it was fed into the HP.80 programme.

However further research was deemed necessary and the HP.88 was built to gather more data. Work was done by Blackburn who mated the new wings to a Supermarine Attacker fuselage. The

## VICTOR B.2 XL233 WITTERING WING

**This aircraft was operated by Wittering Wing until it was converted to a tanker in 1970 when it served with 232 OCU and 55 Sqn. Painted in standard RAF camouflage of Dark Green and Medium Sea Grey upper surfaces and White undersides. Wittering Wing shield was on the nose.**

HP.88 had little time to gather data as it was destroyed only 36 days after the first flight but with construction of the HP.80 prototypes nearing completion there would be little point in building another one.

The form of the wings may have been advanced but many other aspects of the design were conventional, the fuel tanks being fitted in the wings and the weapons bay, with space for a 10,000lb atomic bomb, running down the centre of the fuselage.

A pressurised compartment accommodated the crew of five – pilot, co-pilot, navigator/plotter, navigator/radar operator and radio/electronic countermeasures operator. Only the two pilots had the luxury of an ejection seat, the three remaining crew would have to leave via the door, this being fitted with a cover to protect them as they entered the slipstream.

During the May of 1952, work on Victor WB771 was progressing at a steady pace and thoughts turned to the first flight. The facilities at Radlett airfield, Hertfordshire, were deemed unsatisfactory by the Ministry of Supply and it was therefore ordered that the aircraft should be moved to Boscombe Down, where the 10,000ft runway would allow ample space for the untested bomber.

Moving such a large aircraft along the ground – even in sections – meant roads along the route and through London had to be modified in order to accommodate the large loads.

Once everything was settled at Boscombe Down, work commenced on putting WB771 back together and completing it. There was added pressure because at that stage the companies involved were unsure which would be the favoured bomber and Handley Page were keen to beat Avro and display at Farnborough that year.

Delays to the project meant that it did not even get to taxi until the week before Christmas, however. Poor weather meant that it was not until Christmas Eve that Handley Page's chief test pilot, Squadron Leader Hedley George Hazelden was in a position to take the Victor on its first flight. With Ian Bennett as the flight test observer, Hazelden took WB771 on a couple of circuits, landing on the second one for what was an uneventful yet successful first flight. As the New Year arrived it was officially announced that the HP.80

# HANDLEY PAGE VICTOR

**DURING THE FALKLANDS WAR OF 1982, THE TANKER FLEET WAS REQUIRED TO UNDERTAKE THE LONGEST MISSION**

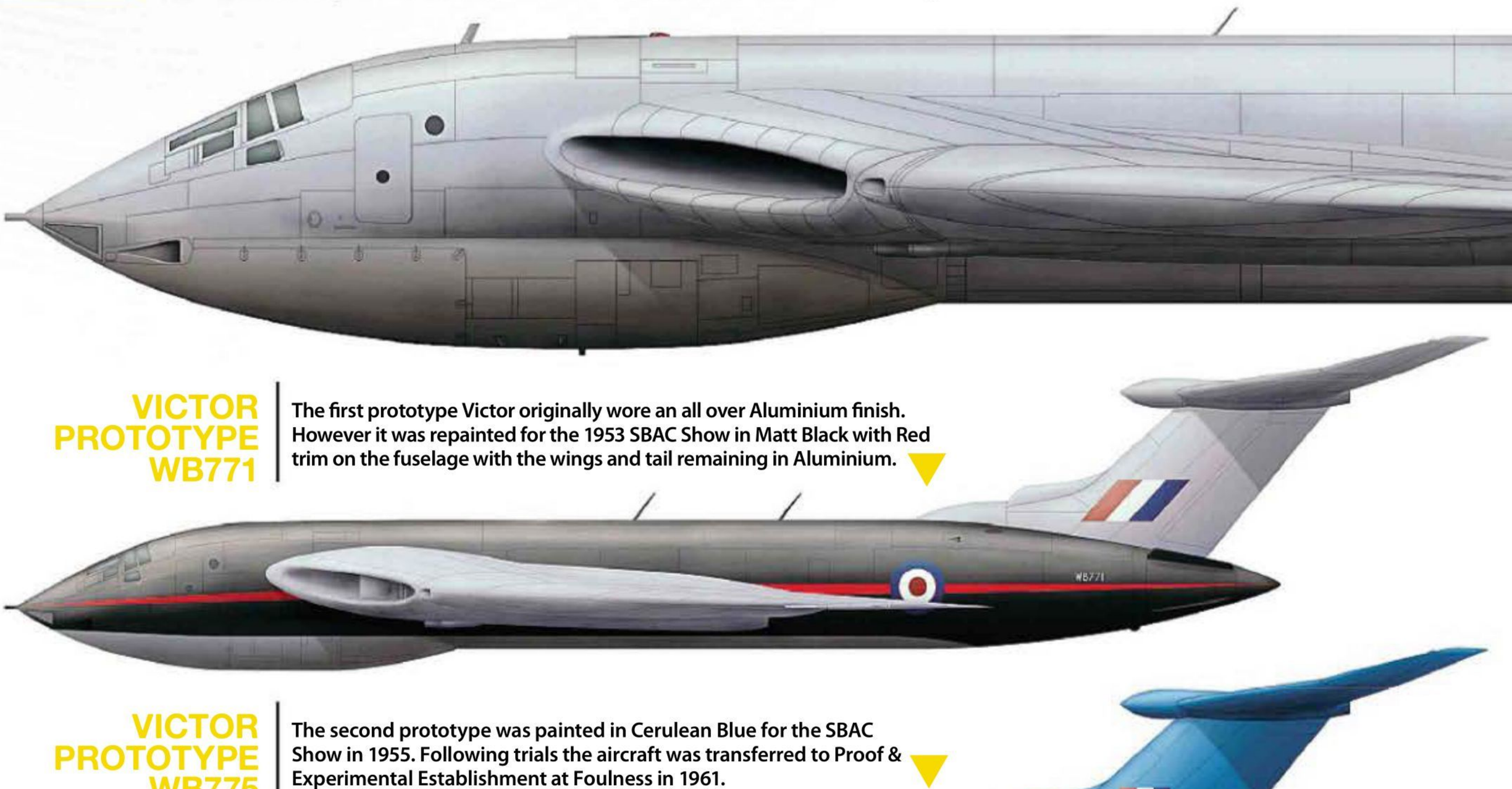
would henceforth be known as the Victor in keeping with the preference of the new bombers being named with a V.

Early trials showed some issues with the undercarriage system. The braking system, which would stop the spinning once the wheels were retracted, had remained locked and caused all 16 of the main wheel tyres to burst upon touchdown. Subsequent flights raised yet more issues but fitting cameras into the undercarriage bays enabled the engineers to quickly identify the problems and deal with them.

When it first flew, WB771 was finished in an overall aluminium and light grey finish but by the time of the SBAC show at Farnborough in 1953 it was wearing a very distinctive scheme of a black fuselage with a red cheat line running the length of the fuselage. The wings and tail retained the aluminium scheme.

Testing continued at a steady pace until the aircraft reached Mach 0.98 during one high-speed test, causing damage to the skin of the tail. To keep up the testing programme, the tail of WB775 was swapped with that of WB771 and flying continued smoothly until July 14, 1954, when it was called upon to undertake speed calibration tests at Cranfield. At the controls was Ronald Ecclestone (Hazelden having a prior engagement that day), as he began a second pass of the airfield at speed the tailplane detached from the fin, causing the aircraft to descend at speed into the runway and disintegrate. None of the five crew survived.

Two months later WB775 was ready to fly and testing resumed. The following March, having completed the trials satisfactorily it was delivered to A&AEE for testing by the RAF. By this time an order had been placed for the B.1, which only had minor differences to the second prototype so by February 1, 1956, the first production Victor, XA917, flew. Unlike subsequent B.1s, XA917 was destined for A&AEE where it remained until a crash landing at Radlett in January 1964. The Rolls-Royce Avon had originally been proposed for the Victor but by the time the B.1 flew it was fitted with four




**VICTOR PROTOTYPE WB771**

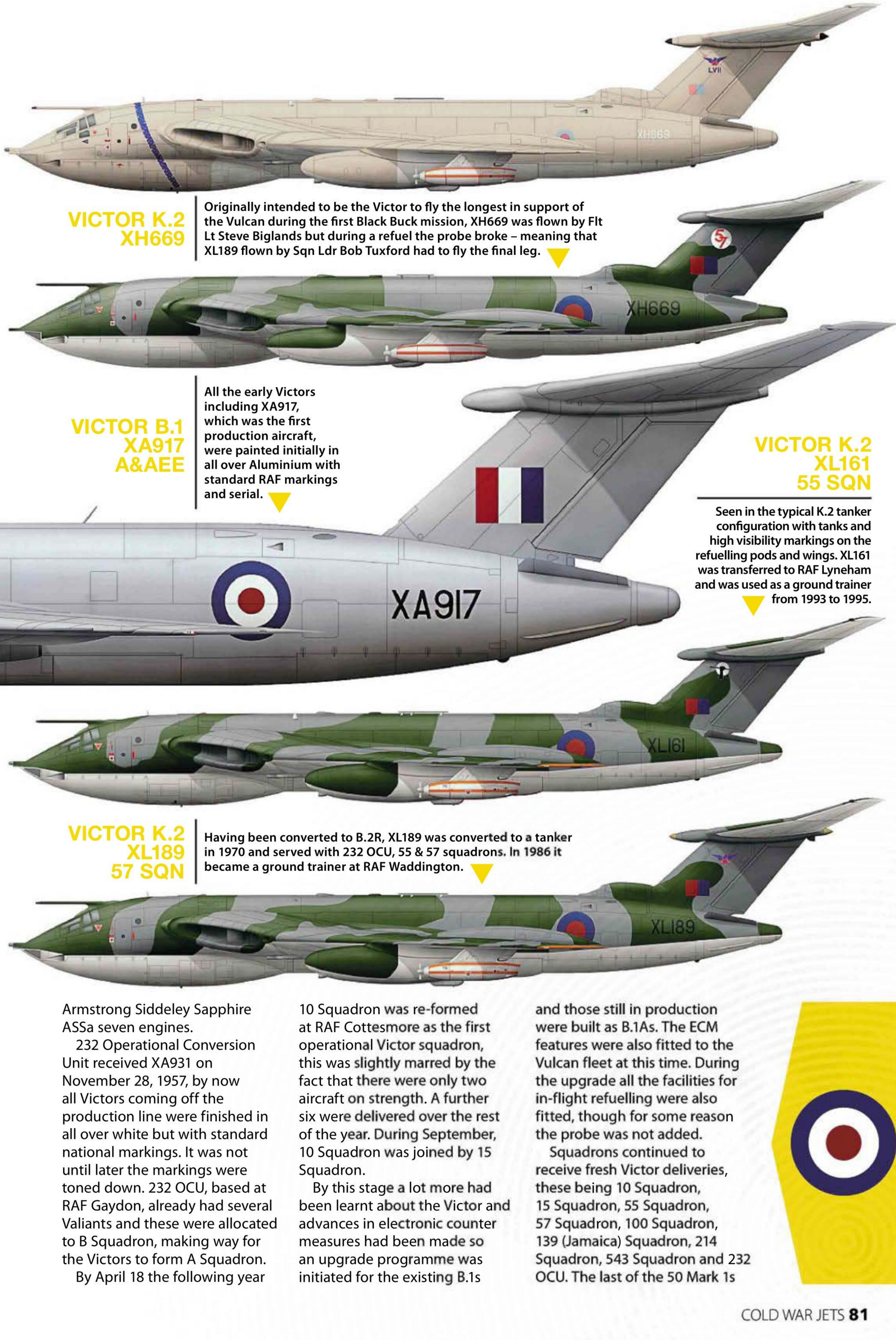
The first prototype Victor originally wore an all over Aluminium finish. However it was repainted for the 1953 SBAC Show in Matt Black with Red trim on the fuselage with the wings and tail remaining in Aluminium.

**VICTOR PROTOTYPE WB775**

The second prototype was painted in Cerulean Blue for the SBAC Show in 1955. Following trials the aircraft was transferred to Proof & Experimental Establishment at Foulness in 1961.

**VICTOR B.2R XL513 139 SQN**

XL513 was the first Victor to wear camouflage and was used for camouflage trials. Unlike all other camouflaged Victors this aircraft was painted in NATO Green (ref No. 409) and NATO Grey (ref No. 407), it also retained the anti flash roundel on the fuselage. The aircraft crashed on take-off at RAF Marham in 1976 due to a bird strike.




**VICTOR K.2**
**XH669**

**Originally intended to be the Victor to fly the longest in support of the Vulcan during the first Black Buck mission, XH669 was flown by Flt Lt Steve Biglands but during a refuel the probe broke – meaning that XL189 flown by Sqn Ldr Bob Tuxford had to fly the final leg.**

**VICTOR B.1**
**XA917**
**A&AEE**

**All the early Victors including XA917, which was the first production aircraft, were painted initially in all over Aluminium with standard RAF markings and serial.**

**VICTOR K.2**
**XL161**
**55 SQN**

**Seen in the typical K.2 tanker configuration with tanks and high visibility markings on the refuelling pods and wings. XL161 was transferred to RAF Lyneham and was used as a ground trainer from 1993 to 1995.**

**VICTOR K.2**
**XL189**
**57 SQN**

**Having been converted to B.2R, XL189 was converted to a tanker in 1970 and served with 232 OCU, 55 & 57 squadrons. In 1986 it became a ground trainer at RAF Waddington.**

Armstrong Siddeley Sapphire ASSa seven engines.

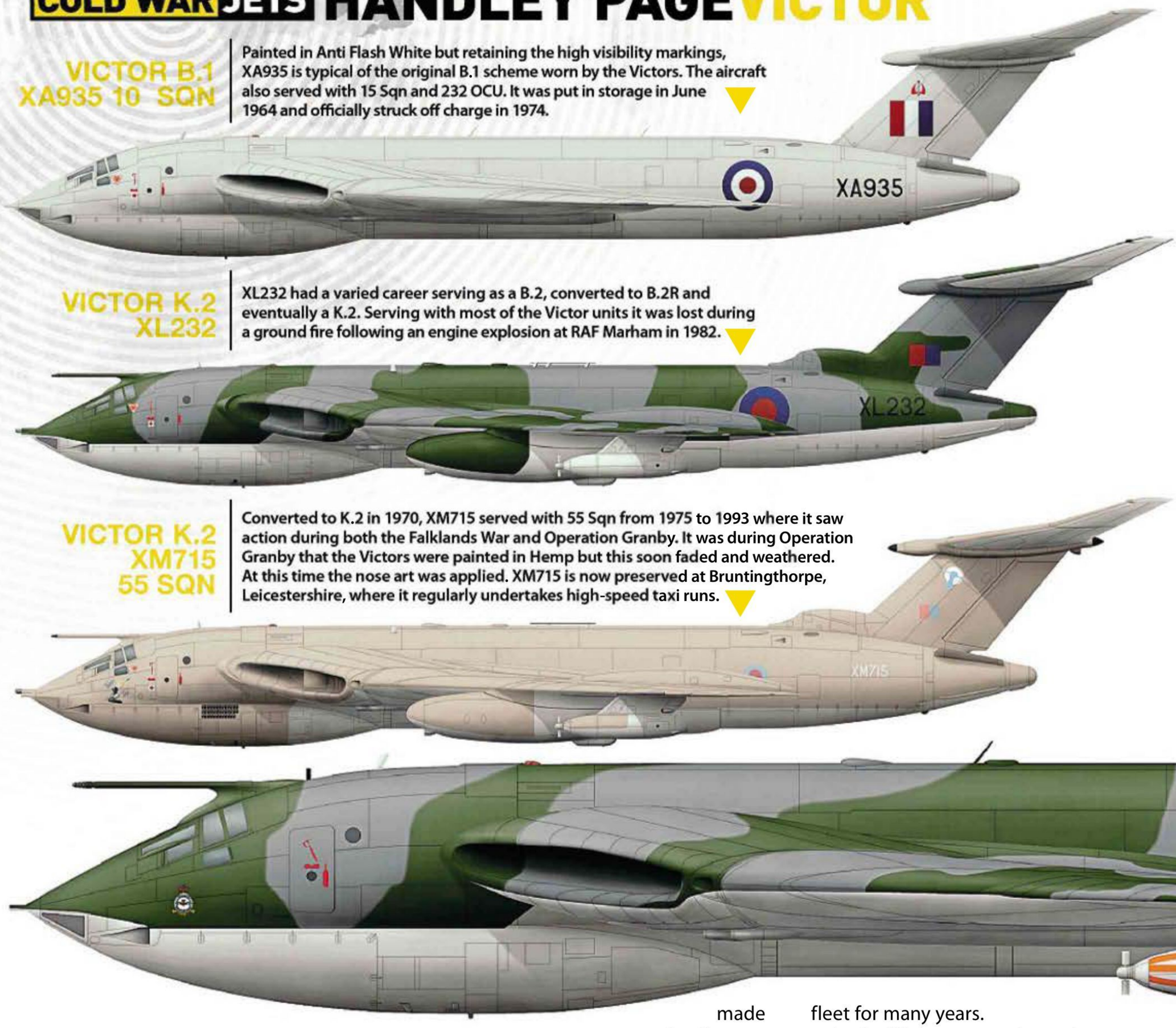
232 Operational Conversion Unit received XA931 on November 28, 1957, by now all Victors coming off the production line were finished in all over white but with standard national markings. It was not until later the markings were toned down. 232 OCU, based at RAF Gaydon, already had several Valiants and these were allocated to B Squadron, making way for the Victors to form A Squadron.

By April 18 the following year 10 Squadron was re-formed at RAF Cottesmore as the first operational Victor squadron, this was slightly marred by the fact that there were only two aircraft on strength. A further six were delivered over the rest of the year. During September, 10 Squadron was joined by 15 Squadron.

By this stage a lot more had been learnt about the Victor and advances in electronic counter measures had been made so an upgrade programme was initiated for the existing B.1s and those still in production were built as B.1As. The ECM features were also fitted to the Vulcan fleet at this time. During the upgrade all the facilities for in-flight refuelling were also fitted, though for some reason the probe was not added.

Squadrons continued to receive fresh Victor deliveries, these being 10 Squadron, 15 Squadron, 55 Squadron, 57 Squadron, 100 Squadron, 139 (Jamaica) Squadron, 214 Squadron, 543 Squadron and 232 OCU. The last of the 50 Mark 1s

# HANDLEY PAGE VICTOR


VICTOR B.1
XA935 10 SQN
Painted in Anti Flash White but retaining the high visibility markings, XA935 is typical of the original B.1 scheme worn by the Victors. The aircraft also served with 15 Sqn and 232 OCU. It was put in storage in June 1964 and officially struck off charge in 1974.
XA935
VICTOR K.2
XL232
XL232 had a varied career serving as a B.2, converted to B.2R and eventually a K.2. Serving with most of the Victor units it was lost during a ground fire following an engine explosion at RAF Marham in 1982.
XL232
VICTOR K.2
XM715
55 SQN
Converted to K.2 in 1970, XM715 served with 55 Sqn from 1975 to 1993 where it saw action during both the Falklands War and Operation Granby. It was during Operation Granby that the Victors were painted in Hemp but this soon faded and weathered. At this time the nose art was applied. XM715 is now preserved at Bruntingthorpe, Leicestershire, where it regularly undertakes high-speed taxi runs.
XM715

**LIKE SO MANY OTHER COLD WAR AIRCRAFT SEVERAL EXAMPLES ARE PRESERVED AND TWO ARE STILL REGULARLY TAXIED**

was delivered to the Honnington Wing on March 3, 1961.

Once again advances in Soviet SAM technology forced the pace of aircraft design in the UK.

In the belief that altitude would still allow bombers to evade the missiles, the Victor B.2 was conceived. Initially it was proposed that the wing would be redesigned and six Sapphire ASSa.9 engines would be fitted, the engine being in development for a thin wing version of the Javelin. With the cancellation of that project, Handley Page had to opt for the Rolls-Royce Conway R.Co.11 for the extra power required.

The Victor had been designed to carry Britain's nuclear weapons: Blue Danube, Yellow Sun and later Blue Steel, which due to the size and the low clearance of the Victor bomb bay made loading a challenge. The Blue Steel stand-off missile also had a number of reliability issues and was only seen as a short term nuclear deterrent. The days of the Victor being a nuclear bomber were clearly numbered. Its service life was extended with the retirement of the Valiant fleet and the need for a replacement tanker however.

Naturally, if the Valiant could do it so could the Victor and the type was converted. Trials had begun in 1964 when XA918 was adapted and tested for suitability. By May 1965, six had been successfully converted, two drogues fitted to the wings and a third in the fuselage. 55 Squadron became a combined bomber and tanker squadron at RAF Marham. Marham becoming the home of the Victor tanker fleet for many years.

As the Mk.Is came to the end of their flying hours they were replaced with the B.2s, by now the nuclear bomber concept was becoming obsolete and the role of nuclear deterrent was taken over by the Royal Navy's submarine fleet. During the Falklands War of 1982, the tanker fleet was required to undertake the longest mission involving refuelling ever contemplated and the planning stage was extensive.

To stop the Argentines basing their fast jets at Port Stanley, the runway needed to be taken out of the equation. The Vulcan was chosen for the job but it would need to make an 8000 mile journey and for this 11 tankers were required. Several of the Victors used were just to refuel other Victors and allow them the range to refuel the Vulcans. A

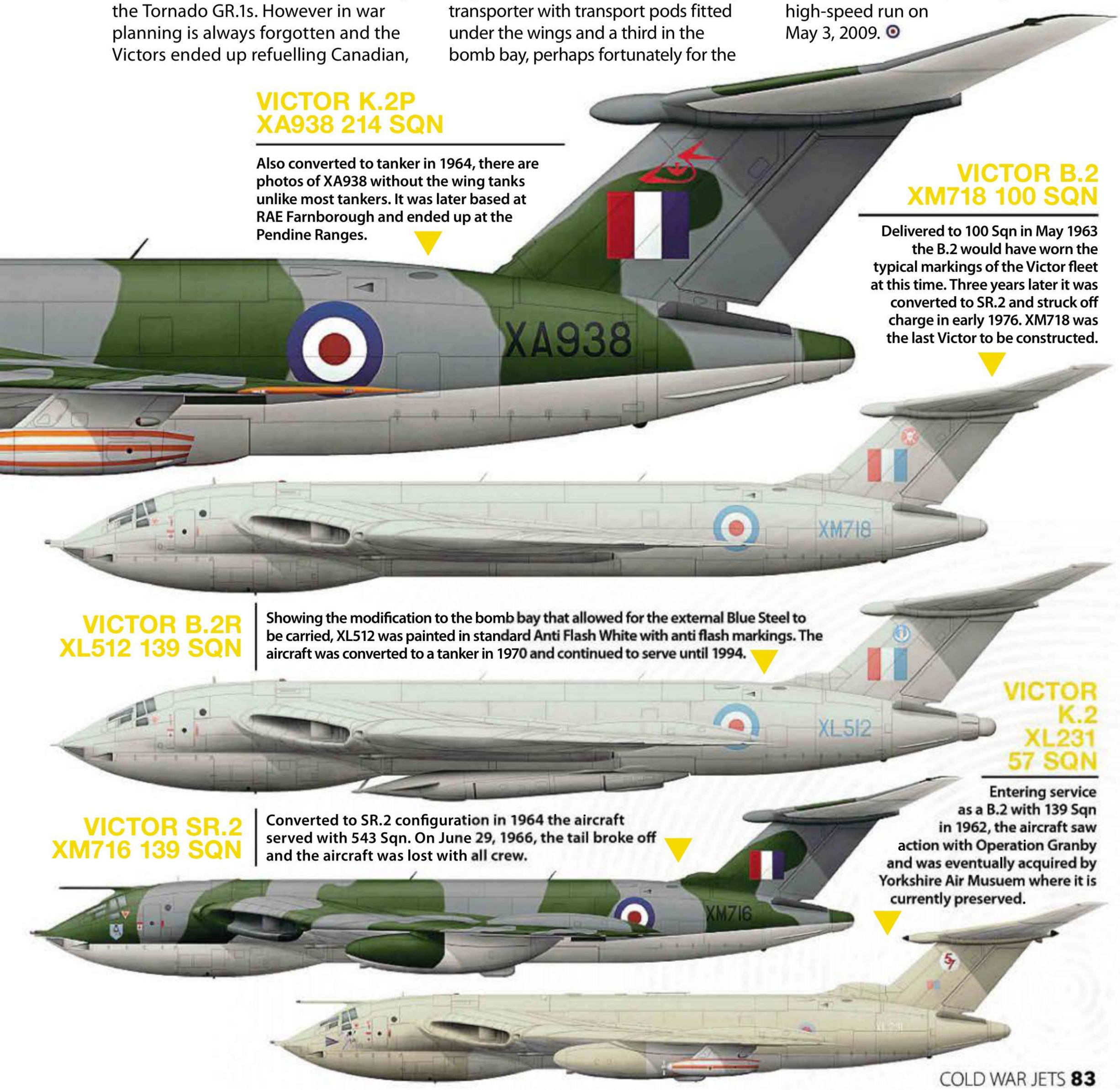
| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| **HP.80** | **111FT 7IN** | **110FT / 33.53M** | **26FT 10.5IN** | **4 X AS SAPPHIRE 101** |
| **B.1** | **114FT 11IN / 35.05M** | **110FT / 33.53M** | **28FT 1.5IN / 8.57M** | **4 X AS SAPPHIRE A.S.SA.7** |
| **B.1A** | **114FT 11IN / 35.05M** | **110FT / 33.53M** | **28FT 1.5IN / 8.57M** | **4 X AS SAPPHIRE A.S.SA.7** |
| **K.1** | **114FT 11IN / 35.05M** | **110FT / 33.53M** | **28FT 1.5IN / 8.57M** | **4 X AS SAPPHIRE A.S.SA.7** |
| **B.2** | **114FT 11IN / 35.05M** | **120FT / 36.58M** | **28FT 1.5IN / 8.57M** | **4 X RR CONWAY R.CO.11** |
| **B.2RS** | **114FT 11IN / 35.05M** | **120FT / 36.58M** | **28FT 1.5IN / 8.57M** | **4 X RR CONWAY R.CO.11** |
| **B(SR).2** | **114FT 11IN / 35.05M** | **120FT / 36.58M** | **28FT 1.5IN / 8.57M** | **4 X RR CONWAY R.CO.11** |
| **K.2** | **114FT 11IN / 35.05M** | **117FT / 35.66M** | **28FT 1.5IN / 8.57M** | **4 X RR CONWAY R.CO.11** |

total of five raids were flown, two more were planned but aborted, one due to weather and the other due to a fault with the tankers.

Victors were also involved in Operation Granby and Desert Storm during 1990/1991 when 10 Victors were painted in a hemp scheme and sent to the Gulf region, the original plan being to only support RAF Jaguars and Tornado F.3s, the VC10s refuelling the Tornado GR.1s. However in war planning is always forgotten and the Victors ended up refuelling Canadian, French, USN and USAF aircraft as well. Only two years later on October 15, 1993, 55 Squadron, the last Victor squadron was disbanded and the aircraft dispersed to museums or scrapped.

The Victor was a remarkably flexible aircraft and this was why it remained in service for so long. Finding secondary uses for it saved money and at one stage it was even considered as a troop transporter with transport pods fitted under the wings and a third in the bomb bay, perhaps fortunately for the troops this concept never made it off the drawing board.

Like so many other Cold War aircraft several examples are preserved and two are still regularly taxied, XL231 Lusty Lindy at the Yorkshire Air Museum, Elvington, and XM715 Teasin' Tina at Bruntingthorpe, the latter having made the last unofficial flight of a Victor when a miscommunication led to an inadvertent short hop during a high-speed run on May 3, 2009.




**VICTOR K.2P XA938 214 SQN**

**Also converted to tanker in 1964, there are photos of XA938 without the wing tanks unlike most tankers. It was later based at RAE Farnborough and ended up at the Pendine Ranges.**

**VICTOR B.2 XM718 100 SQN**

**Delivered to 100 Sqn in May 1963 the B.2 would have worn the typical markings of the Victor fleet at this time. Three years later it was converted to SR.2 and struck off charge in early 1976. XM718 was the last Victor to be constructed.**

**VICTOR B.2R XL512 139 SQN**

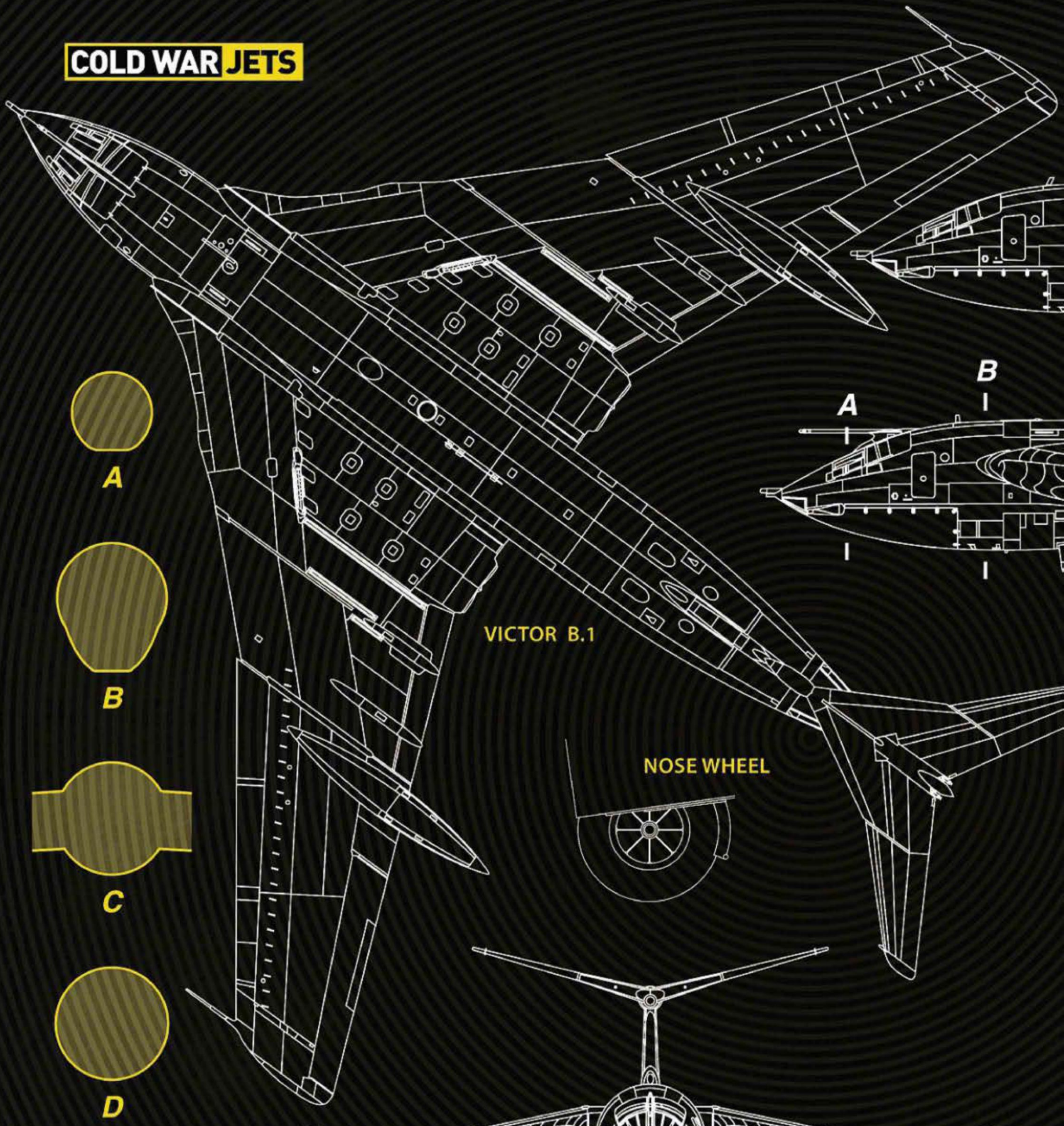
**Showing the modification to the bomb bay that allowed for the external Blue Steel to be carried, XL512 was painted in standard Anti Flash White with anti flash markings. The aircraft was converted to a tanker in 1970 and continued to serve until 1994.**

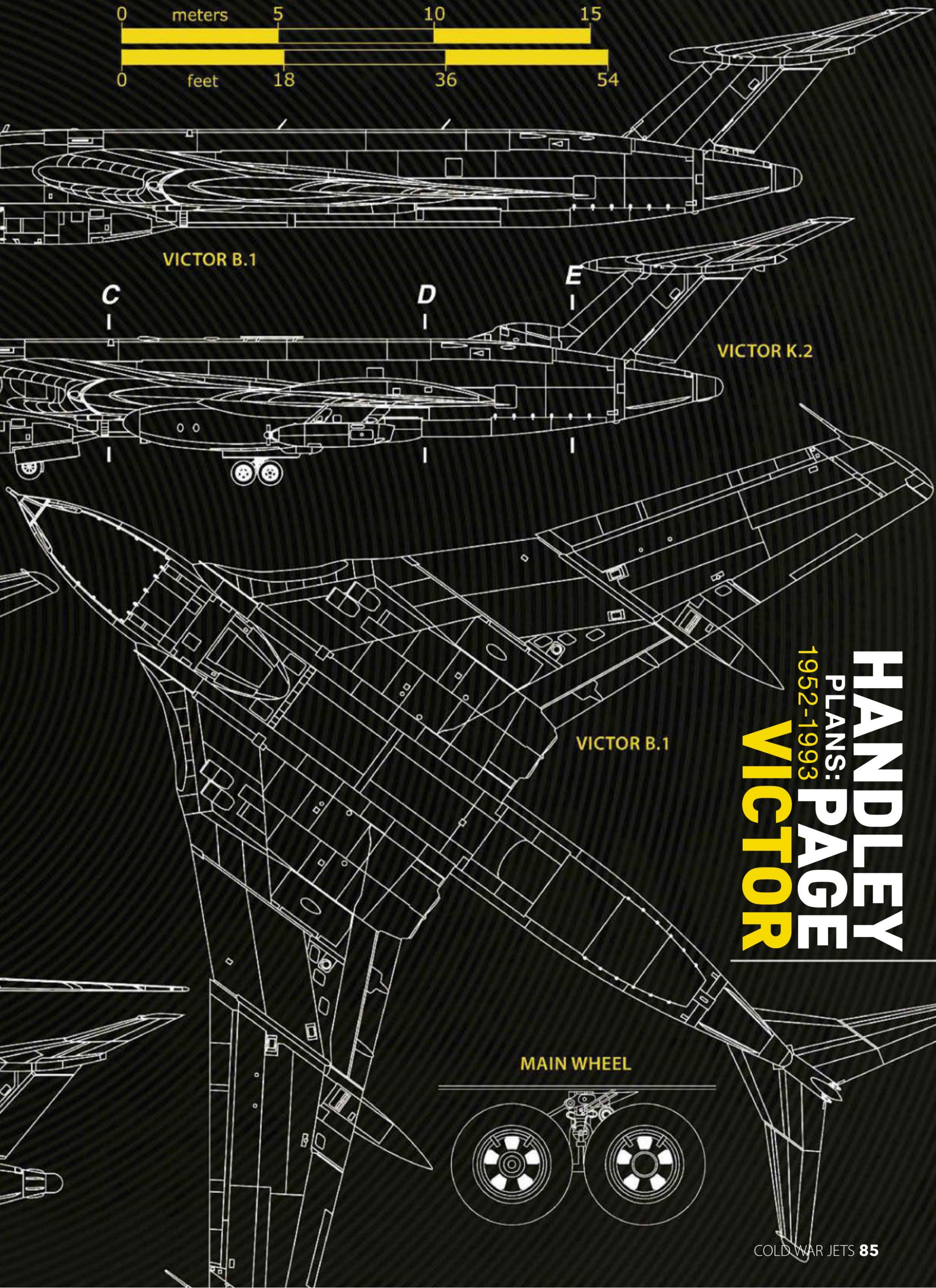
**VICTOR K.2 XL231 57 SQN**

**Entering service as a B.2 with 139 Sqn in 1962, the aircraft saw action with Operation Granby and was eventually acquired by Yorkshire Air Musuem where it is currently preserved.**

**VICTOR SR.2 XM716 139 SQN**

**Converted to SR.2 configuration in 1964 the aircraft served with 543 Sqn. On June 29, 1966, the tail broke off and the aircraft was lost with all crew.**


A
B
C
D
E
VICTOR B.1
NOSE WHEEL
VICTOR B.1
VICTOR B.2R




# HANDLEY PAGE VICTOR

PLANS: 1952-1993

1952-1992

**The triangular behemoth that is the Avro Vulcan flew for the last time 63 years after it first took to the skies. In that time it became an icon of Bomber Command, a symbol of the Cold War, yet it only saw action bombing a tiny airfield on an island miles from any other British territory in the South Atlantic during the twilight years of its military service. Despite being considerably larger and more powerful than the Avro Lancaster, only 11 years separated their first flights. The Vulcan represented a quantum leap in bombers and seen in flight it never failed to impress.**

## AVRO VULCAN B.2 XM607 44 SQN

During the Red Flag '77 exercises at Nellis AFB, Nevada, XM607 had an experimental desert camouflage applied of Light Stone and Dark Earth, the upper surfaces were Dark Green and Medium Sea Grey. XM607 went on to be used in the first of the Black Buck missions to bomb the runway at Port Stanley during the Falklands War.

# AVRO VULCAN

When it came to a solution to Specification B.35/46, Roy Chadwick and the design team at Avro were already aware of the research conducted by Professor Alexander Lippisch into delta wing designs in Germany during the Second World War and it was this which influenced even the early sketches for the Avro 698.

With no experience of delta wing aircraft and the 698 being such a massive undertaking, one third scale versions were constructed to explore flight characteristics under the 707 programme. The information gathered from the 707s and aerodynamic

**DESPITE ONLY 136 BEING BUILT, THE VULCAN HAS LEFT A LASTING IMPRESSION ON ALL WHO SAW AND HEARD ONE FLY**

testing at RAE Farnborough led to extensive alterations to the 698, resulting in a three-month delay to construction.

The Valiant had first flown in 1951 but there was a race between Handley Page and Avro to see who could get their bomber airborne first, the prototype Valiant having been transported to Boscombe Down for reassembly in anticipation of flight testing. At this stage both companies believed that only one of the two bombers would enter service – so there was considerable pressure within Avro to get the prototype in the air.

With the parts being transported from the factory in Manchester to nearby Woodford, it was on August 30, 1952, that after one high-speed taxi Roly Falk opened up the four Rolls-Royce Avon RA.3s and lifted VX770 off for the first time. The test flight was slightly marred by a warning light that indicated the undercarriage had failed to retract. A hastily scrambled Vampire and Avro 707 confirmed all was in order following a quick visual inspection but they did discover that the rear undercarriage fairings had become detached due to wing flexing which had not been anticipated.

Faulk later claimed that it was easier to handle than an Avro Anson. VX770 was later upgraded to the more powerful Armstrong Siddeley Saphire ASSs.6, the Avons only being an underpowered interim engine.

Trials showed that the straight leading edge resulted in buffeting at high altitude, this would result in a lack of accuracy during bombing runs so a kink in the leading edge was introduced to negate the issue.

The Vulcan B.1 formally entered service when XA895 and XA898, the seventh and 10th production Vulcans were delivered to 230 OCU in January 1957, like the rest of the first 15 they had the Olympus 101 powerplant. By the May of 1957, 83 Squadron had formed and began receiving the B.1, XA904 the 16th off the line being the first with the more powerful Olympus 104 engines.

The early B.1s which were used for various trials had been finished in all over aluminium but those entering service were painted in high gloss Anti Flash White.

The B.1a saw minor changes to the standard Vulcan including the facility for in-flight refuelling, though the probes were not fitted at the time. The ECM equipment designed primarily for the B.2 was introduced and included an enlarging of

XM607

# GLOSTER JAVELIN

## AVRO VULCAN B.1 XA895 230 OPERATIONAL CONVERSION UNIT

**One of the first production batch of Vulcan B.1s it was delivered in July 1956 to 230 OCU and was finished in all over Aluminium. Later converted to B.1A configuration. Following ECM trials with the A&AEE it was scrapped in September 1968.**

the tail cone to accommodate it.

While the B.1 was entering service the design team turned their attention to improving the Vulcan which would see yet another wing known as the Phase 2 wing introduced to eliminate the buffeting expected to once again be encountered at high altitude/speed with the introduction of the more powerful Olympus 201 and later 301 engines, the engines also necessitated a redesigned intake to allow for the higher airflow required. Further to these two major changes a range of other modifications were made including the undercarriage, flying controls and new electronic counter-measures which required a redesigned tail. 83 Squadron received the first B.2 on December 23, 1960.

The Vulcan was initially designed as a nuclear deterrent but the B.2 was the only type to be used in a conflict – during the Falklands War when flights of almost 6800 nautical miles were flown to attack the island. The first of the five successful missions was flown by XM607 on the night of April 30/May 1 and hit the runway at Port Stanley.

Due to the pressures placed on the Victor tanker fleet during the Falklands War, the existing aircraft needed supplementing. An interim solution was to convert six Vulcans to tankers. XM603 was used as a test frame for the tanker conversion programme at Woodford, following this XH558, XH560, XH561, XJ825, XL445 and XM571 were selected for conversion. The K.2 could now carry a total

## AVRO VULCAN B.2 XH562

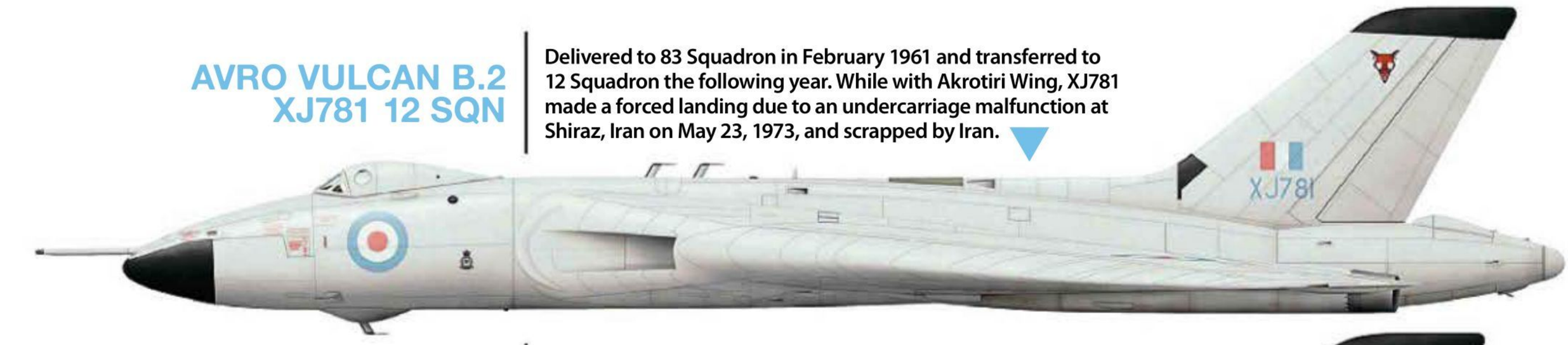
**While on a tour of New Zealand in 1972, XH562 was zapped at Ohakea, also on the nosewheel door is a 75 Squadron RNZAF badge. It ended up on the firedump at Catterick in 1982 and was finally scrapped in 1984. Painted in Medium Sea Grey and Dark Green with Light Aircraft Grey underside.**

## AVRO VULCAN B.1 XA900 230 OPERATIONAL CONVERSION UNIT

**Finished in all over White with standard roundels, XA900 served with 230 OCU and 11 Squadron, displayed at Cosford as last B.1 until scrapped in 1986.**

## AVRO VULCAN B.2 XJ781 12 SQN

Delivered to 83 Squadron in February 1961 and transferred to 12 Squadron the following year. While with Akrotiri Wing, XJ781 made a forced landing due to an undercarriage malfunction at Shiraz, Iran on May 23, 1973, and scrapped by Iran.




## AVRO VULCAN B.2 XL317 617 SQN

Painted in all over Gloss White with pale makings and squadron lightning bolts on the tail, XL317 was photographed carrying a Blue Steel training missile in 1963. The missile appears to be painted in PRU Blue.

## AVRO VULCAN K.2 XJ825 50 SQN

Originally delivered to the RAF in July 1961 the aircraft was one of six allocated to tanker duties, converted in May 1982 it was struck off charge in 1984 and scrapped in 1992. Painted in Medium Sea Grey and Dark Green upper surfaces with Light Aircraft Grey and White panels to the rear with high visibility tanker markings on the underside.

## AVRO VULCAN B.2 XH558

As the first B.2 to enter service, XH558 was delivered to the RAF on August 1, 1960, and continued to fly for 55 years until October 28, 2015. Having been converted to K.2 configuration in 1982, two years later it was converted back and became the RAF display Vulcan. Once retired it was restored and displayed by the Vulcan to the Sky Trust. Painted in all over gloss Dark Green and Dark Sea Grey.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| B.1 | 97FT 1IN / 29.58M | 99FT / 30.17M | 26FT 6IN / 29.08M | 4 X BRISTOL SIDDELEY OLYMPUS 101 |
| B.1A | 99FT 11IN / 30.45M NOT INCLUDING IFR PROBE | 99FT / 30.17M | 26FT 6IN / 29.08M | 4 X BRISTOL SIDDELEY OLYMPUS 101 |
| B.2 | 99FT 11IN / 30.45M NOT INCLUDING IFR PROBE | 111FT / 33.83M | 27FT 2IN / 8.28M | 4 X BRISTOL SIDDELEY OLYMPUS 201 OR 301 |
| SR.2 | 99FT 11IN / 30.45M NOT INCLUDING IFR PROBE | 111FT / 33.83M | 27FT 2IN / 8.28M | 4 X BRISTOL SIDDELEY OLYMPUS 201 OR 301 |
| K.2 | 99FT 11IN / 30.45M NOT INCLUDING IFR PROBE | 111FT / 33.83M | 27FT 2IN / 8.28M | 4 X BRISTOL SIDDELEY OLYMPUS 201 OR 301 |

of 96,500lb of fuel. The hose drogue unit was housed in the tail but the ECM cone was insufficient so an inelegant 'dog box' was fitted underneath the rear fuselage to accommodate the excess equipment.

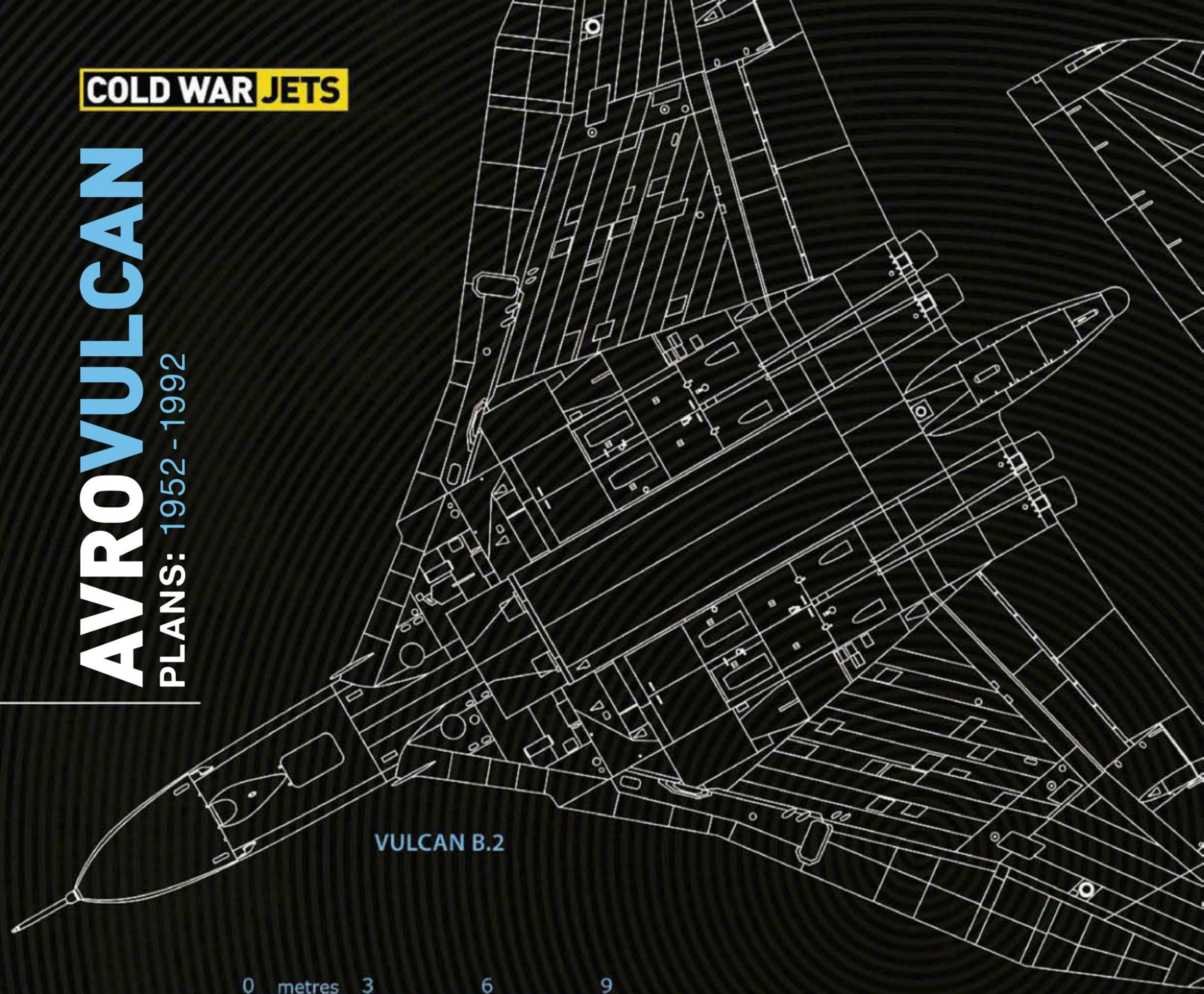
The six tankers served with 50 Squadron until the VC10s became fully operational and the Vulcan was no longer required. The squadron was disbanded in March 1984 and the Vulcan was officially retired from operational service.

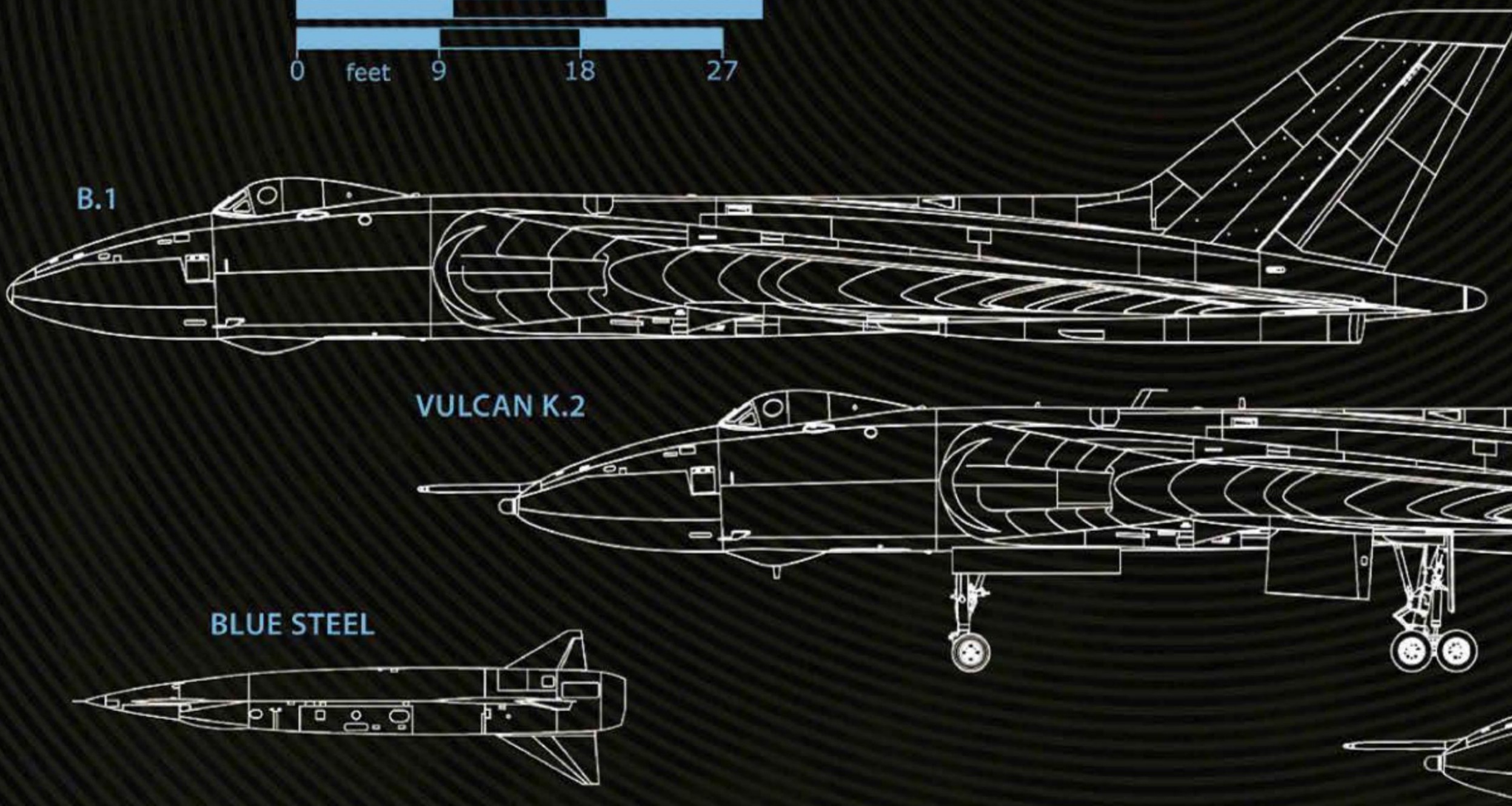
This was not the end of the Vulcan's time with the RAF however – a pair being retained by the Vulcan Display Flight which continued to display the Vulcan until 1992. XL426 was first used for the display and later replaced by XH558, which by this time had been converted back to standard B.2 configuration from the K.2 configuration. Following budget cuts even XH558 was retired by the RAF, but it was kept in flying condition and entered private ownership where it returned to flight and dominated airshows across the UK between 2007 and 2015.

This may have helped keep the iconic delta wing bomber in the public eye and along with the Lightning it is one of the most impressive aircraft to be produced by the British aviation industry. Despite only 136 being built, the Vulcan has left a lasting impression on all who saw and heard one fly.

# AVRO VULCAN

**PLANS:** 1952 - 1992



VULCAN B.2

A

B

C

D

E

NOSE WHEEL

MAIN WHEELS

A B C D E

VULCAN B.2

# ENGLISH ELECTRIC LIGHTNING

1954-1993

**The English Electric Lightning is perhaps the most iconic of all the British-built jet fighters. Schoolboys dreamed of strapping in and experiencing the 16,000lb of thrust the two Rolls-Royce Avon engines could produce while accelerating to Mach 2.**

The Lightning entered service in 1959 and was to remain operational for 29 years with several squadrons and was exported to Saudi Arabia. Originally looking resplendent in polished metal this glorious finish was later covered up by the greys and green that camouflage necessitated but a Lighting display was always a sight to behold, to this day it still amazes crowds with high-speed taxi runs at Bruntingthorpe, Leicestershire and Cranfield, Bedfordshire.

The type's origins can be traced back to 1948 and specification ER.103, which required a research aircraft that could fly at a minimum of Mach 1.4, this reputedly came about through lobbying by W E W 'Teddy' Petter, head of the design team at EECo and already responsible for the Canberra. The outcome of this programme was the Fairey Delta 2 and the English Electric P.1. As a result of the proposal put forward by English Electric, the Air Ministry issued Specification F.23/49 which called for further development of the EECo P.1.

## LIGHTING F.6
## XR763 5 SQN

**XR763 wears Dark Sea Grey and Medium Sea Grey on its upper surfaces with Light Aircraft Grey undersides. The aircraft received damage during a live firing exercise and was written off at Akrotiri, Cyprus, on July 1, 1987. Pilot safely ejected.**

The original design of the P.1 did not include the single tail but instead finlets fitted to the tips of the tail due to a concern that a jettisoned canopy might destroy control surfaces leading to a loss of stability and problems with ejection. This was soon rejected in favour of the single tail fin. The concept however already had the highly swept wings and the vertical mounting of the twin engines (unique among production aircraft) along with the large single intake in the nose which became distinctive features of all the Lightning variants. Soon after in 1950 Petter left for Folland and responsibility for the project was passed to Freddie Page.

Construction of the prototype WG760 was completed and the P.1A was transported by road to Boscombe Down where it first flew on August 4, 1954, with Wg Cdr Roland Beamont at the controls. During this flight it reached Mach 0.85. It became the first British built aircraft to exceed Mach 1 in level flight a week later during only its third test flight. It was soon identified that the aircraft had an issue with fuel consumption and exacerbated by small fuel tanks. To rectify this, a belly tank was added to the second P.1 WG763. However the issue was never fully resolved and even in service a Lightning could burn through all of its fuel in under 18 minutes.

A further 21 production P.1s were built and used for trials including some being sent to the first RAF Lightning unit, The Air Fighting Development Squadron at RAF

# ENGLISH ELECTRIC LIGHTNING

## LIGHTNING F.2A XN784 19 SQN

Built as a F.2, XN784 was later upgraded to F.2A standard while serving with 19 Squadron, RAF Germany in early 1969. During front line service it its retained natural metal finish with squadron markings. In retirement XN784 is on display at Baarlo, Holland, and wears a non-authentic camouflage scheme.

## LIGHTING F.2A XN790 19 SN

XN790 first served with 92 Squadron in NMF as a F2. It was converted to F.2A and transferred to 19 Squadron. Based at RAF Gütersloh in 1975, XN790 was flown by Fg Off C M Rowley. Upper surfaces painted Dark Green over NMF.

## LIGHTING F.6 XR773 11 SQN

First flew in February 1966, Roland Beamont being the pilot. While with 11 Squadron, WR773 wore the standard Dark Sea Grey upper surfaces with Light Aircraft Grey undersides, the pilot's name on the port side is Flt Lt R A J Heath. The aircraft also served with 74, 56 and 5 Squadrons and continued to fly once retired in South Africa at Thunder City. While in civilian ownership the codes G-OPIB and later ZU-BEW were worn. XR773 is currently mothballed.

## LIGHTING F.6 XR724 11 SQN

Originally built as an F.3, XR724 was converted and operated by 11 Squadron during the early 1970s. Later used as a chase aircraft for the Tornado programme, based at Warton.

Coltishall, Norfolk, where extensive testing was undertaken as the RAF prepared to declare the Lightning fit for service.

The F.1 was very similar to the production P.1B, having the Avon 200R fitted, two 30mm Aden cannon and externally being virtually identical in appearance apart from a slight increase in surface area of the tail. The belly tank now sported small fins too, a feature retained on all future Lightnings.

74 Squadron was the first to convert to the Lightning F.1 from the Hawker Hunter in July 1960. During this time the squadron was also based at RAF Coltishall alongside the AFDS. Unlike the Hunters, which had been camouflaged, the Lightings were delivered unpainted apart from standard markings, the only change 74 Sqn made was to paint the tail fin black with the squadron badge in a white circle and the squadron bars on the nose.

Now the F.1 had been delivered production of the F.1A commenced and began to be delivered to both 56 and 111 squadrons, both based at RAF Wattisham, Suffolk. The F.1A had a number of minor upgrades, the most significant being the Avon 210R along with the option to fit a refuelling probe under the port wing, thus increasing the range significantly.

To the casual observer the F.2 looked identical to the F.1, the only difference being a small intake duct on the spine. Internally however there were a number of improvements including nose wheel steering, OR.946 instrument suite,

**74 SQUADRON WAS THE FIRST TO CONVERT TO THE LIGHTNING F.1 FROM THE HAWKER HUNTER IN JULY 1960**

## LIGHTING F.6 XR770 5 SQN

**Following a first flight on December 16, 1966, the aircraft was displayed in a Saudi Arabian scheme at 1966 SBAC before entering service with 74 Squadron. XR770 was transferred to 5 Squadron, RAF Binbrook. Upon retirement the airframe ended up at the NATO Aircraft Museum, Grimsby. Restored by the NATO Aircraft Museum it is currently on loan to 5 Squadron where it is displayed at RAF Waddington. Upper surfaces are Dark Sea Grey.**

## LIGHTING F.3 XR713 5 SQN

**First flown on October 21, 1964, XR713 was delivered to 111 Squadron the following January. During the 1970s it was operated by 5 Squadron where it was coded S and later AR. It was later repainted in 111 Squadron markings when it became a mascot for the squadron at RAF Leuchars while operating the Tornado.**

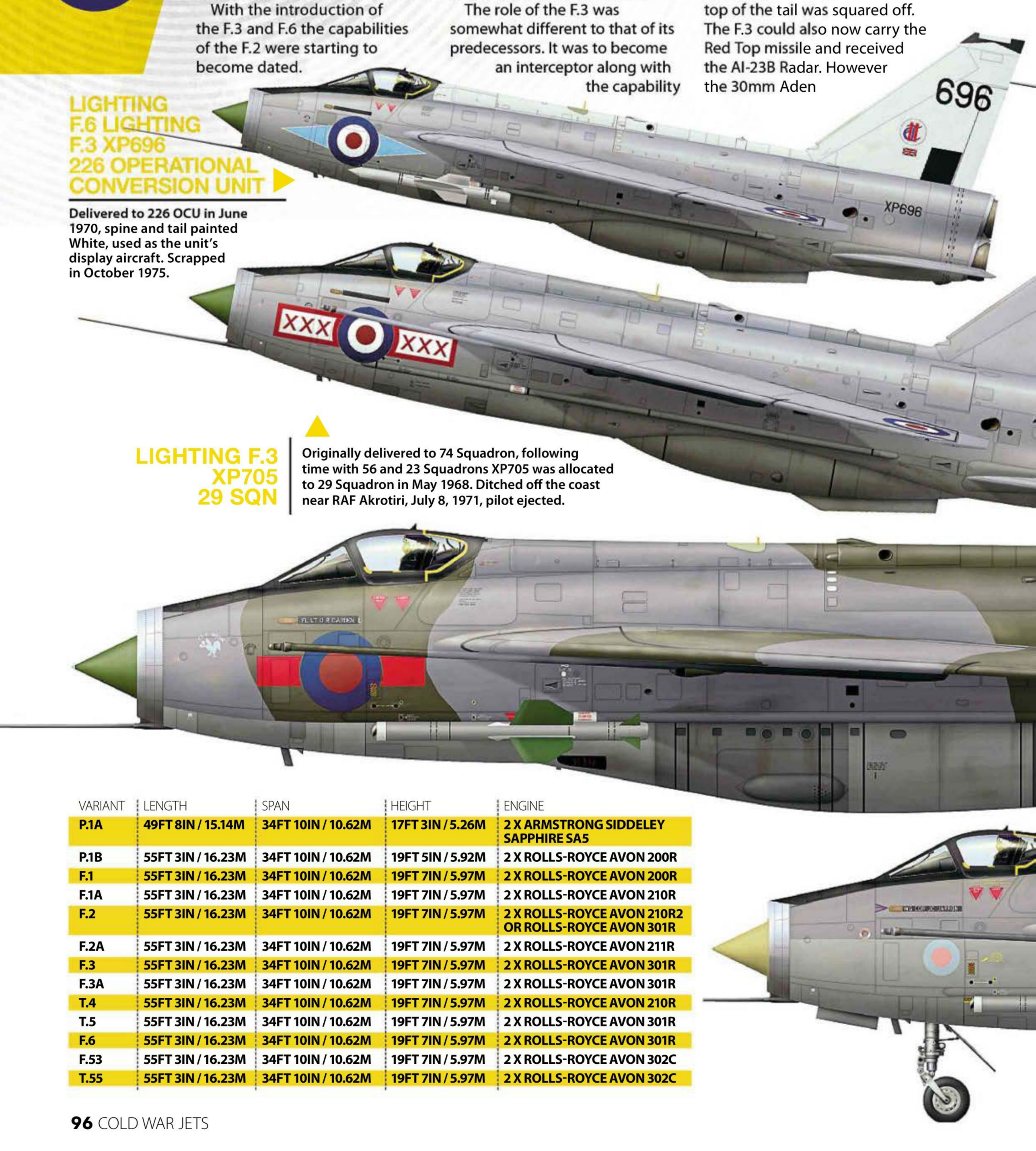
# ENGLISH ELECTRIC LIGHTNING

liquid oxygen breathing system and a variable reheat system. A total of 44 F.2s made it into service starting in late 1962 with 19 and 92 Squadrons at RAF Leconfield, Yorkshire. During 1965 the two squadrons were posted to Germany and based at RAF Gütersloh for over a decade.

With the introduction of the F.3 and F.6 the capabilities of the F.2 were starting to become dated.

From January 1968, the two squadrons began to receive the upgraded F.2A. Many of the changes such as the enlarged belly tank (already included with the F.3) and Avon R211 engines gave improved performance and range however the two 30mm Aden cannon were retained.

The role of the F.3 was somewhat different to that of its predecessors. It was to become an interceptor along with the capability for overseas deployment. To increase its range the capacity of the ventral tank was increased to 560 gal and the wings could now carry two 540 gal overwing tanks, the wing leading edge was also modified with a cambered leding edge extension. Avon R301 engines were fitted and the top of the tail was squared off. The F.3 could also now carry the Red Top missile and received the AI-23B Radar. However the 30mm Aden




**LIGHTING F.6 LIGHTING F.3 XP696 226 OPERATIONAL CONVERSION UNIT**

**Delivered to 226 OCU in June 1970, spine and tail painted White, used as the unit's display aircraft. Scrapped in October 1975.**

**LIGHTING F.3 XP705 29 SQN**

**Originally delivered to 74 Squadron, following time with 56 and 23 Squadrons XP705 was allocated to 29 Squadron in May 1968. Ditched off the coast near RAF Akrotiri, July 8, 1971, pilot ejected.**

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| P.1A | 49FT 8IN / 15.14M | 34FT 10IN / 10.62M | 17FT 3IN / 5.26M | 2 X ARMSTRONG SIDDELEY SAPPHIRE SA5 |
| P.1B | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 5IN / 5.92M | 2 X ROLLS-ROYCE AVON 200R |
| F.1 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 200R |
| F.1A | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 210R |
| F.2 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 210R2 OR ROLLS-ROYCE AVON 301R |
| F.2A | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 211R |
| F.3 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 301R |
| F.3A | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 301R |
| T.4 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 210R |
| T.5 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 301R |
| F.6 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 301R |
| F.53 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 302C |
| T.55 | 55FT 3IN / 16.23M | 34FT 10IN / 10.62M | 19FT 7IN / 5.97M | 2 X ROLLS-ROYCE AVON 302C |

## LIGHTING F.6 XR773 56 SQN

**Wearing the earlier markings of 56 Squadron over a NMF, XR773 was also fitted with overwing tanks.**

## LIGHTING F.2A XN782 92 SQN

**92 Squadron's Lightnings are possibly best known for the NMF scheme with the tail and spine painted in Bright Blue, the unit having previously operated the all over blue Hunters as the Blue Diamonds.**

## LIGHTING F.6 XS899 5 SQN

**Delivered to 5 Squadron in January 1967, XS899 served exclusively with that unit. It was painted in two tone camouflage with red bar and a 43 Squadron zap of a cock with boxing gloves on the nose (presumably a zap), pilot's name Fl Lt D R Carden, RAF Leuchars, September 1977. While most of the airframe was scrapped, the cockpit has survived. First flight June 8, 1966.**

## LIGHTING F.2A XN780 92 SQN

**Delivered to 5 Squadron in August 1966, XS903 was displayed at the Paris Air Show the following year. Transferred to 11 Squadron in 1980. Upon retirement flown to Elvington and displayed at the Yorkshire Aviation Musuem.**

# ENGLISH ELECTRIC LIGHTNING

## LIGHTING F.6 XS904 11 SQN

One of the most photographed Lightnings, XS907, served almost exclusively with 11 Squadron. Having retired from front line service, the aircraft was retained by BAe for Tornado F3 radar trials. The aircraft regularly undertakes fast taxi runs at Bruntingthorpe, Leicestershire. Standard cold war two tone camouflage scheme with NMF undersides.

## LIGHTING F.6 XS921 74 SQN

XS921 has a distinctive black tail and squadron badge on tail over NMF. Tail flash was picked out in yellow. While serving with 11 Squadron, the aircraft was written off following a loss of control over the North Sea. Flt Lt C Penrice ejected and survived.

## LIGHTING F.2A XN780 92 SQN

The standard scheme for later 92 Squadron Lightnings was Dark Green upper surfaces, NMF retained on lower surfaces. Below the squadron badge on the tail of XN780 are two blue diamonds as a tribute to the display team. The aircraft was struck off charge in 1975 following a ground fire and used as a decoy. Finally scrapped in 1984.

**. IT WAS A UNIQUE AND ICONIC AIRCRAFT WITH MANY EXAMPLES SURVIVING IN MUSEUMS**

cannon were removed.

The final version of the Lightning was an upgrade of the F.3 with an increase in fuel capacity and completely revised ventral tank with significantly larger fins, there was also the capacity to fit two 30mm Aden cannon to the front of the tank.

The T.4 was based on the F.1 airframe with the nose section widened to accommodate the two pilots in a side by side configuration. Wind tunnel tests had proven that a tandem layout would lead to a loss of directional stability. The dorsal spine was also enlarged to fit with the wider cockpit. Like the later F.1s it had the Avon 210R but it saw the removal of the cannons. The T5 was based around the F.3 with the Avon 301R but was otherwise almost identical to the T.4.

The Lightning served with front line squadrons for 28 years and continued to perform well against many newer types such as the F-4 Phantom or the Harrier GR.3 but limited range and firepower counted against the aircraft when compared to the F-4 and the Tornado, which was being introduced.

Squadrons started retiring the Lightning in 1974 and the type was officially fully retired at the end of June 1988. However this was not the end of the Lightning and several continued to fly as targets at the Aberporth range against Buccaneers and Tornados while the Foxhunter radar was being developed. With the hours

## LIGHTING F.6 XS895 111 SQN

**NMF with squadron markings and an extended tail flash made up F.6 XS895's 111 Squadron scheme. Also served with 5 & 11 squadrons and the Lightning Training Flight.**

## LIGHTING F.6 XS938 23 SQN

**XS938 is shown here in standard early NMF scheme with squadron badge on tail and bar on fuselage. Based at RAF Leuchars in the late 60s and early 70s.**

running out on the remaining airframes and the programme nearing completion, the aircraft were disposed of.

The last flight of a Lightning in British airspace was on January 21, 1993, when F.6 XS904 took off from Warton for the final time and was delivered to Bruntingthorpe where it is preserved with F.3 XR713 and F.6 XR728.

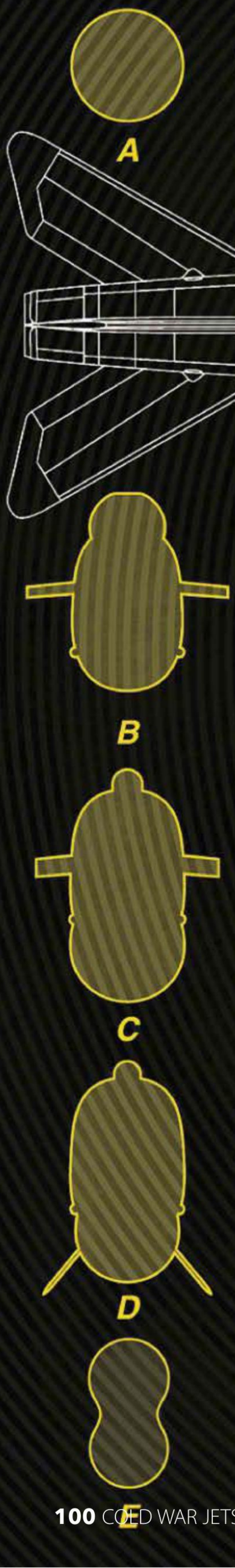
Unlike many other cold war jets the Lightning was not an aircraft that could lend itself to a range of roles, the only exception being the trainer. It was a very specific design for the role and despite being regularly scrambled to intercept Soviet aircraft entering British airspace it was never required to engage in hostile activities. It was a unique and iconic aircraft, with many examples surviving in museums.

There are airworthy examples in South Africa and several that still undertake high-speed taxi runs are preserved in the UK.

## LIGHTING F.6 XR728 LIGHTNING TRAINING FLIGHT

**XR728 began life as an F.3 but was converted to F.6 before entering service with 23 Squadron in November 1967, before moving on to 5, 56 and 11 Squadrons. The aircraft ended its service career with the Lightning Training Flight (LTF) and was Binbrook's CO's personal aircraft.**

LIGHTNING F.6




LIGHTNING F.6

LIGHTNING F.6

LIGHTNING F.6

# ENGLISH ELECTRIC
## PLANS: 1953 - 1993 LIGHTNING

LIGHTNING F.1

0 meters 2 4 6

0 feet 6 12 18

LIGHTNING F.2A

LIGHTNING F.3

LIGHTNING F.6

A B C D E

# HAWKER SIDDELEY/ BAE HARRIER

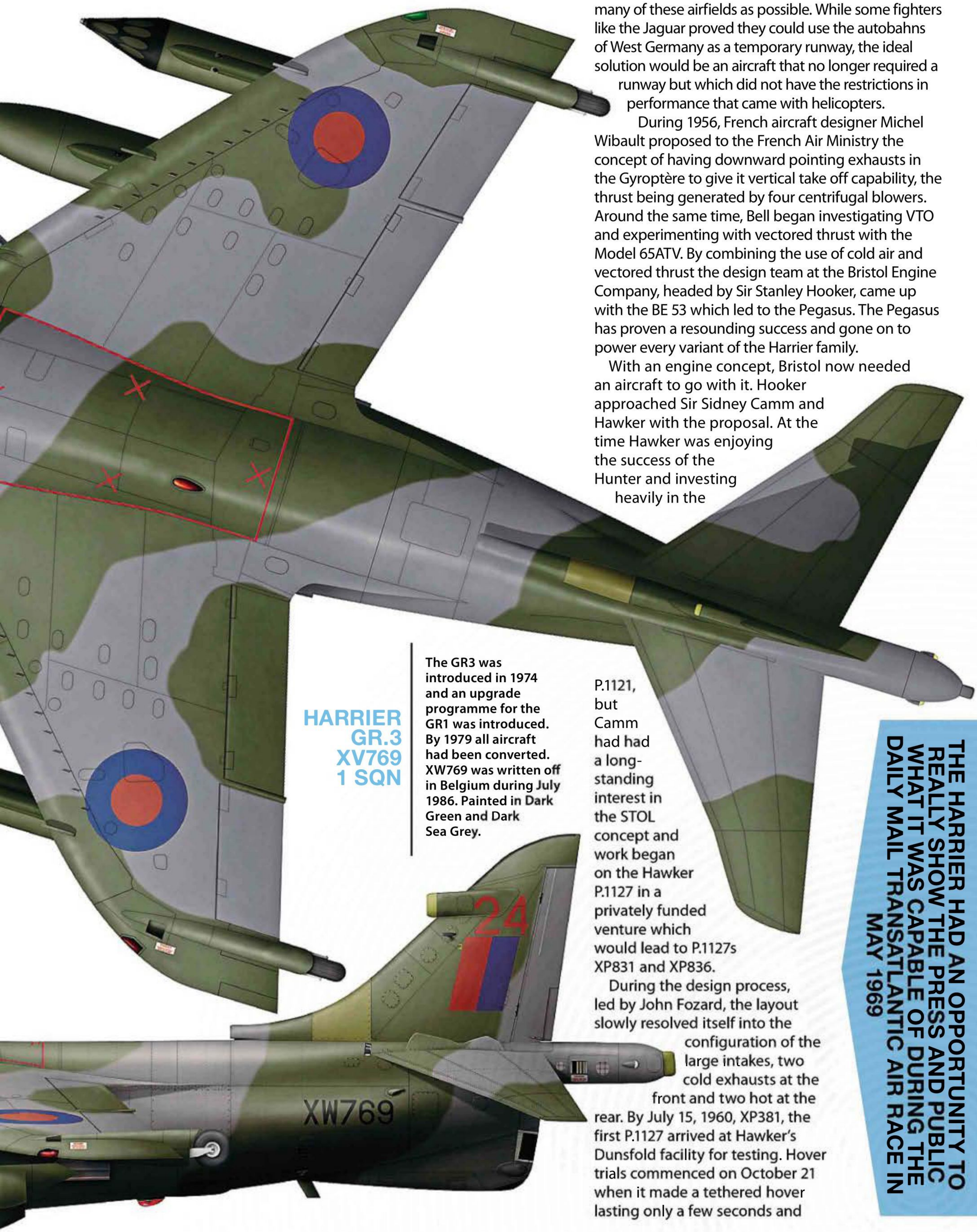
1960-2010

**The Harrier is still considered a unique and highly versatile aircraft. No other fixed wing aircraft has operated in the conditions that a Harrier has. It was designed to operate where no runway existed and could, if the need arose, take off vertically from a grass field. GR.5s even flew from the grass runway at Shuttleworth, Bedfordshire – a feat that a Lightning or Tornado might struggle to achieve.**

It may have been the Sea Harrier that first proved the capabilities of the type during the Falklands war but the GR.3 also had a vital role and Harriers have been involved in several conflicts since. The birth of the Harrier is a long and protracted affair involving several versions and nations before it finally entered service in 1969.

At the height of the Battle of Britain the bombing campaign turned from the airfields to civilian targets in a move which is considered by many to be the turning point in the fight. Even with damaged airfields the Spitfires and Hurricanes of Fighter Command could still operate from the grass strips which required minimal repairs. As the Cold War escalated and technology advanced, however, the fighter aircraft used by NATO became bigger, more powerful and heavier – requiring longer and longer hard runways.

It was assumed by planners that a nuclear missile strike by the Soviets would take out as




## HARRIER GR.3 XV769 1 SQN

**The GR3 was introduced in 1974 and an upgrade programme for the GR1 was introduced. By 1979 all aircraft had been converted. XW769 was written off in Belgium during July 1986. Painted in Dark Green and Dark Sea Grey.**

many of these airfields as possible. While some fighters like the Jaguar proved they could use the autobahns of West Germany as a temporary runway, the ideal solution would be an aircraft that no longer required a runway but which did not have the restrictions in performance that came with helicopters.

During 1956, French aircraft designer Michel Wibault proposed to the French Air Ministry the concept of having downward pointing exhausts in the Gyroptère to give it vertical take off capability, the thrust being generated by four centrifugal blowers. Around the same time, Bell began investigating VTO and experimenting with vectored thrust with the Model 65ATV. By combining the use of cold air and vectored thrust the design team at the Bristol Engine Company, headed by Sir Stanley Hooker, came up with the BE 53 which led to the Pegasus. The Pegasus has proven a resounding success and gone on to power every variant of the Harrier family.

With an engine concept, Bristol now needed an aircraft to go with it. Hooker approached Sir Sidney Camm and Hawker with the proposal. At the time Hawker was enjoying the success of the Hunter and investing heavily in the P.1121, but Camm had had a long-standing interest in the STOL concept and work began on the Hawker P.1127 in a privately funded venture which would lead to P.1127s XP831 and XP836.

During the design process, led by John Fozard, the layout slowly resolved itself into the configuration of the large intakes, two cold exhausts at the front and two hot at the rear. By July 15, 1960, XP381, the first P.1127 arrived at Hawker's Dunsfold facility for testing. Hover trials commenced on October 21 when it made a tethered hover lasting only a few seconds and

**THE HARRIER HAD AN OPPORTUNITY TO REALLY SHOW THE PRESS AND PUBLIC WHAT IT WAS CAPABLE OF DURING THE DAILY MAIL TRANSATLANTIC AIR RACE IN MAY 1969**

# HAWKER SIDDELEY/BAE HARRIER

rising to 1.5ft, 46cm, Bill Bedford conducting the historic flight with a leg in plaster. The first free hover followed on November 19.

As the P.1127's potential became apparent an order was placed for a further four prototypes, a more powerful Pegasus 2 was installed in the prototypes and an extensive flight testing programme was initiated. In July 1961, XP836 made a conventional take off and transitioned to a hover. During the trials, each of the six was modified and altered in response to the trials data.

In May 1962, nine more were ordered and with the lessons learned from the P.1127s changes were made in a number of areas. These included the intake shape, fuselage lengthening, revised wings and fitment of the Pegasus 5. This version was officially named the Kestrel. By now interest had grown abroad and a Tripartite Evaluation Squadron was formed consisting of British, US and German test pilots.

The conclusion of the trials occurred at around the same time that the Government

**HARRIER GR.3 XV752 1 SQN**

1 Sqn regularly went on exercise to Norway with the Harrier, commencing in September 1970. XV752 received a temporary whitewash snow camouflage over the Dark Green which soon weathered.

**HARRIER GR.3 XV769 1 SQN**

The GR.3 was introduced in 1974 and an upgrade programme for the GR.1 was introduced. By 1979 all aircraft had been converted. XW769 was written off in Belgium during July 1986. Painted in Dark Green and Dark Sea Grey.



**HARRIER GR.3 XW768 20 SQN**

The GR.3 was introduced in 1974 and an upgrade programme for the GR.1 was introduced. By 1979 all aircraft had been converted. XW769 was written off in Belgium during July 1986. Painted in Dark Green and Dark Sea Grey.

**HARRIER GR.1 XW769 20 SQN**

Operated by 20 Sqn who used the GR1 and GR3 while based at RAF Wildenrath, West Germany, between 1970 and 1977 before they converted to the Jaguar. The squadron later returned to the Harrier.

cancelled the P.1154, a supersonic version of the Kestrel, and the RAF were clearly interested in the potential of the diminutive jet.

An order was now placed for the P.1127 (RAF) which would integrate some of the hardware intended for the P.1154 – redesigned undercarriage and extended wings which had the provision for four pylons. It may have still looked like a Kestrel but there were sufficient changes to warrant it being considered a new aircraft and XV276 was now known as the Harrier GR.1.

The Harrier had an opportunity to really show the press and public what it was capable of during the Daily Mail Transatlantic Air Race in May 1969. To commemorate the 50th anniversary of the first crossing of the Atlantic by Alcock and Brown a race was held between the Post Office Tower, London, and the Empire State Building, New York followed by a return trip. The Harrier took off from a coal yard by St Pancras station and landed at the Bristol Basin in a winning time of 6 hours 11 minutes. On the return leg a Navy Phantom won.

The inaugural flight of XV738, the first production GR.1 took place on December 28, 1967. By the end of 1968 a total of 6 had been completed, so at the Harrier Operational Conversion Unit was formed in January 1969, RAF pilots began to familiarise themselves with the type. In April 1969, 1 Squadron began to receive the first of their Harriers and commence a 41 year association with the type.

As a trainer version had yet to be built the training schedule for the 1 Squadron pilots was intensive, involving a helicopter course and a ground school course before undertaking a conventional flight. This was followed by the first short hovers. Naturally this new method of flying was not without mishaps and one Harrier missed the runway and landed in a field of sprouts, inverting itself in the process. The following year the squadron began operating

## HARRIER GR.1 XV919 1 SQN

**XV919 was a 1 Squadron Harrier wearing the original scheme of Dark Sea Grey and Dark Green camouflage with Light Aircraft Grey undersides. While hovering it suffered an engine malfunction and made a heavy landing, receiving CAT4 damage in the process. Later repaired it was converted to GR.3 standard.**

## HARRIER GR.3 XZ993 4 SQN

**The GR.3 was introduced in 1974 and an upgrade programme for the GR.1 was introduced. By 1979 all aircraft had been converted. XW769 was written off in Belgium during July 1986. Painted in Dark Green and Dark Sea Grey.**

**THIS NEW METHOD OF FLYING WAS NOT WITHOUT MISHAPS AND ONE HARRIER MISSED THE RUNWAY AND LANDED IN A FIELD OF SPROUTS**

# COLD WAR JETS HAWKER SIDDELEY/BAE HARRIER

## HARRIER GR.1 XV804 233 OCU

Delivered in January 1971, XV804 was with 233 OCU during 1975. Converted to a GR.3 it later served with 4 Squadron in West Germany before sitting at North Luffenham for many years. XV804 has since been restored.

## HARRIER GR.3 ZD670 1417 FLIGHT

During 1975 there were concerns that Guatemala would invade neighbouring Belize so 1 Sqn were sent out at short notice. The squadron was later replaced by 1417 Flight in 1980 which continued to fly the GR.3, including examples such as ZD670, until 1993.

## HARRIER GR.5 ZD349 3 SQN

While still at RAF Gütersloh, West Germany, 3 Sqn replaced the GR.3 with the second generation GR.5. As a GR.7 ZD349 was flown by Capt Brendan Hearney USMC on January 14, 1994, when it crashed near Aston Somerville, Cotswolds and the pilot was sadly lost. NATO IRR Green and Lichen Green underside.

**THE FIRST OPERATIONAL DEPLOYMENT OF THE HARRIER WAS TO BELIZE IN 1975**

the Harrier in the environment it was designed for, taking off from farmers' fields around RAF Wittering and setting up bases in the surrounding woods.

1 Squadron was followed by 4 Squadron in June 1970 who were based at RAF Wildenrath, West Germany, 233 Operational Conversion Unit was formed at RAF Wittering, these soon being joined by 3 and 20 Squadrons. Due to the location of Wildenrath and distance from the East German border they relocated to RAF Gütersloh which became the permanent home of the German Harriers.

Typical of cold war jets, the single seat version entered service before there was a trainer available to the pilots. The order for the T.2 was placed in 1966 and involved extending the nose for a tandem cockpit. The tail required lengthening due to the shift in the centre of gravity and with later versions the fin was made taller too. This design was also applied to the T.10 which was based on the second generation Harrier.

The first operational deployment of the Harrier was to Belize in 1975. With the threat posed to the former colony of British Honduras, six aircraft were sent from 1 Squadron during Operation Nucha. 1417 Flight was formed and permanently based in Belize, remaining there until July 8, 1993.

With the development of the Pegasus 103 which delivered an extra 1000lb of thrust and the installation of the Laser Rangefinder and Market Target Seekeer (LMRTS) into the revised 'bottle' nose, the type was designated the GR.3.

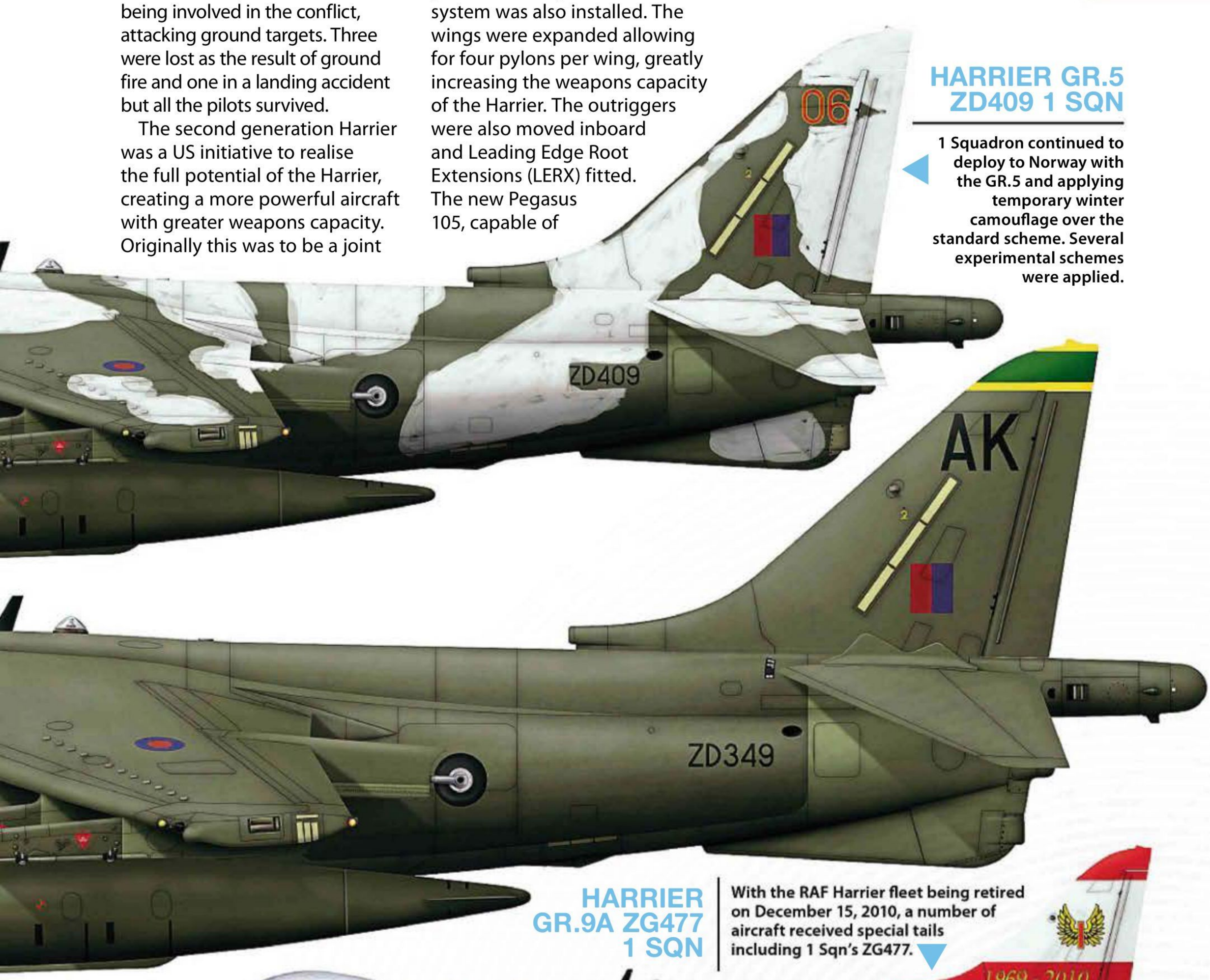
The existing GR.1s all received the upgrade between 1973 and 1976 and a further 40 were built to the new standard.

While the Sea Harrier dominated the Falklands War along with the few bombing missions of the Vulcans, the GR.3 also fulfilled a vital role – 1 Squadron was called upon to prepare for action. Suitable airframes were sourced from the UK squadrons with 10 being involved in the conflict, attacking ground targets. Three were lost as the result of ground fire and one in a landing accident but all the pilots survived.

The second generation Harrier was a US initiative to realise the full potential of the Harrier, creating a more powerful aircraft with greater weapons capacity. Originally this was to be a joint venture but spending cuts in the 1975 Defence White Paper reduced the British involvement significantly.

Unlike the first generation Harriers, the new version was constructed out of a range of composite materials, the nozzle shape revised. Similar to the Sea Harrier, the cockpit was raised and the canopy size increased for greater visibility. A new avionics system was also installed. The wings were expanded allowing for four pylons per wing, greatly increasing the weapons capacity of the Harrier. The outriggers were also moved inboard and Leading Edge Root Extensions (LERX) fitted. The new Pegasus 105, capable of delivering 21,750lb of thrust was fitted to the British version, over 10,000lb more than the original found in the P.1127.

The British version of the AV-8B was designated the GR.5, an order being placed for 60 (plus a further two for development) in 1981. ZD318 was not ready to fly until April 30, 1985, and the RAF had to wait until April 1987 before deliveries to 233 OCU




## HARRIER GR.5 ZD409 1 SQN

**1 Squadron continued to deploy to Norway with the GR.5 and applying temporary winter camouflage over the standard scheme. Several experimental schemes were applied.**

## HARRIER GR.9A ZG477 1 SQN

**With the RAF Harrier fleet being retired on December 15, 2010, a number of aircraft received special tails including 1 Sqn's ZG477.**

## HARRIER GR5 ZD353 233 OCU JULY 1990

**Based at RAF Wittering ZD353 suffered a midair fire, despite landing safely the aircraft was written off on 29th June 1991.**

# HAWKER SIDDELEY/BAE HARRIER

**THE LONGEST DEPLOYMENT OF THE HARRIER FORCE WAS TO AFGHANISTAN**

commenced. The next year 1 Squadron converted to the type, the other squadrons following as aircraft became available.

It may have been advanced compared to the first generation Harriers but there was still room for improvement with the GR.5, with the fitting of the Forward Looking Infra Red (FLIR) system the new GR.7 had the ability to operate at night and in low light conditions, the absence of a radar meant it was not a truly night capable aircraft though. Further improvements and the new Pegasus 107 saw GR.7 become the GR.9, the final version of the RAF Harrier.

These second generation Harriers saw active service, first with the peace keeping forces in Kosovo, undertaking a number of strikes during March/April 1999. Then in February 2003 they were part of Operation Telic during the build up to the second Gulf War. Ten GR.7s were dispatched to the region and remained there until late April. The longest deployment of the Harrier force was to Afghanistan in Operation Herrick, commencing in

## HARRIER GR.9 ZG858 4 SQN

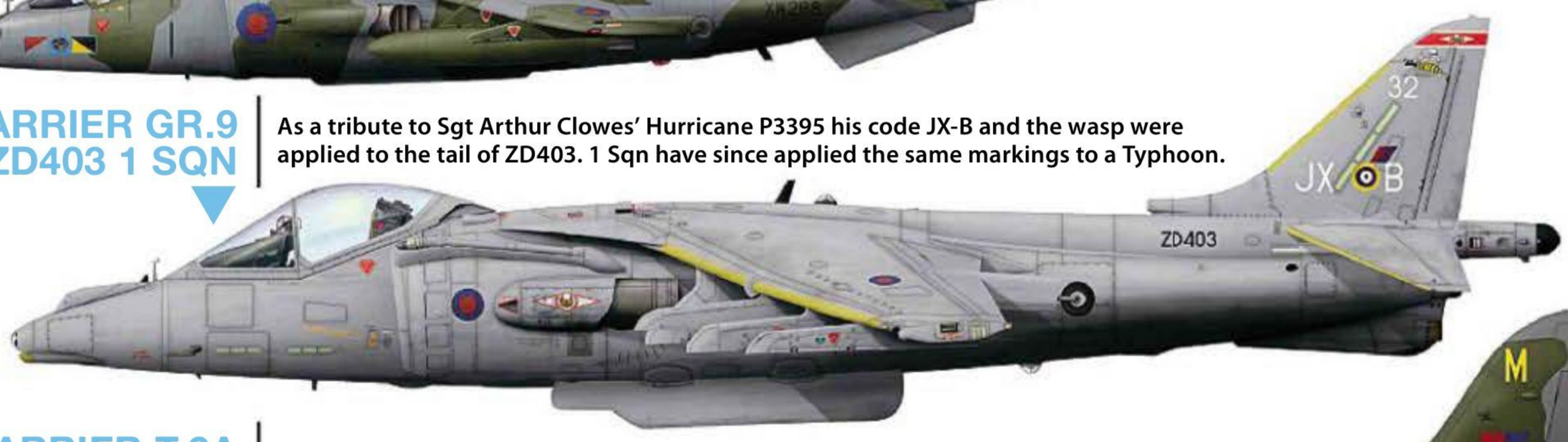
**Similar to tail designs worn by earlier GR.3s ZG858 commemorates 40 years of 4 Sqn's association with the Harrier.**

## HARRIER T.4A XW268 233 OCU

**Built as T.2, XW268 was converted to T.4 and later T.4A and served with 233 OCU from 1979 until 1983 when it was passed to the Royal Navy and converted to T.4N. Currently at Norwich Aviation Museum.**

## HARRIER GR.9 ZD403 1 SQN

**As a tribute to Sgt Arthur Clowes' Hurricane P3395 his code JX-B and the wasp were applied to the tail of ZD403. 1 Sqn have since applied the same markings to a Typhoon.**




## HARRIER T.2A XW926 3 SQN

**Built as a T.2A and delivered in May 1972, later converted to a T.4 it was lost during a display when it collided with GR.3 XV795.**

September 2004 and lasting until June 2009.

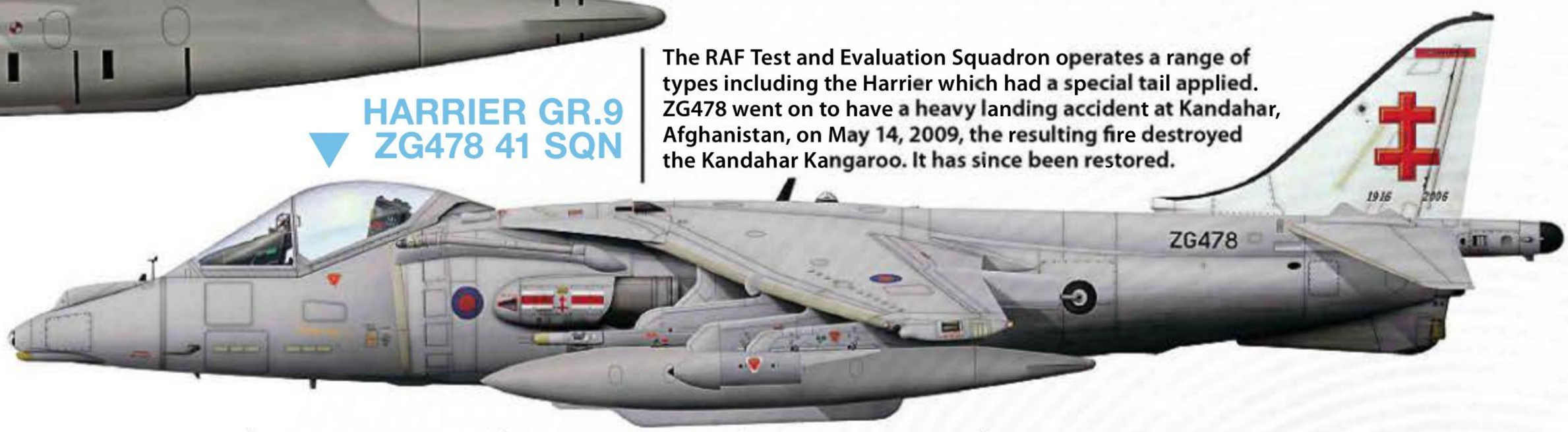
During the upgrade programme to GR.9A, the Government announced in a cost saving measure that the Harrier fleet would be grounded at short notice and the airframes disposed of very cheaply to the US as spare parts. So on December 15, 2010, at a cold wet RAF Cottesmore, 16 Harriers plus a chase plane took off for a final flight. Upon return, ZG506 flown by Group Captain Gary Waterfall, waited until the other planes had landed, made a final bow to the crowd and touched down, bringing to an end the RAF's association with the formidable Harrier.

## HARRIER GR.9 ZG506

**As a homage to the GR.1 scheme of 1969, ZG506 received a similar scheme. It was also the last RAF Harrier to fly when it touched down on December 15, 2010, flown by Group Captain Gary Waterfall, Joint Force Harrier Commander.**

## HARRIER GR.9 ZG478 41 SQN

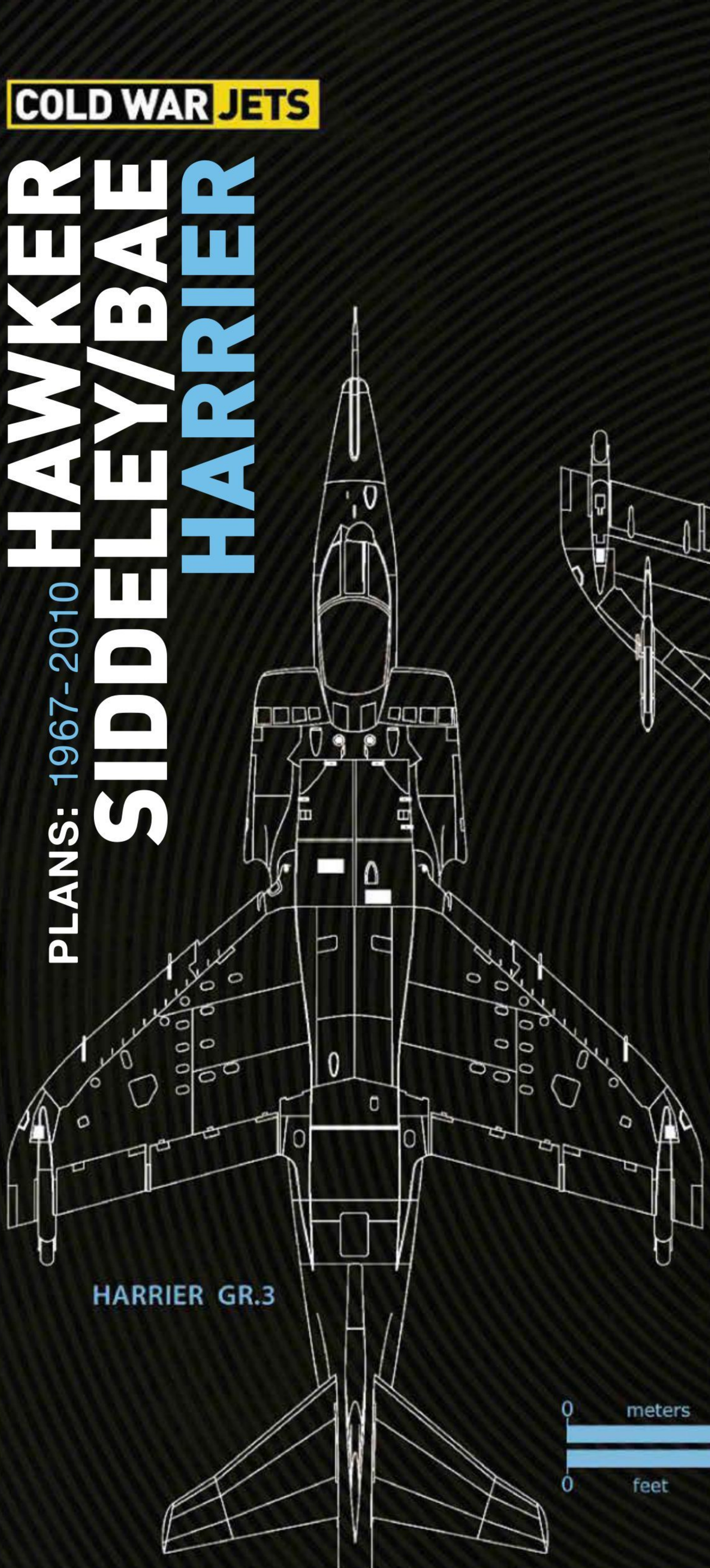
**The RAF Test and Evaluation Squadron operates a range of types including the Harrier which had a special tail applied. ZG478 went on to have a heavy landing accident at Kandahar, Afghanistan, on May 14, 2009, the resulting fire destroyed the Kandahar Kangaroo. It has since been restored.**

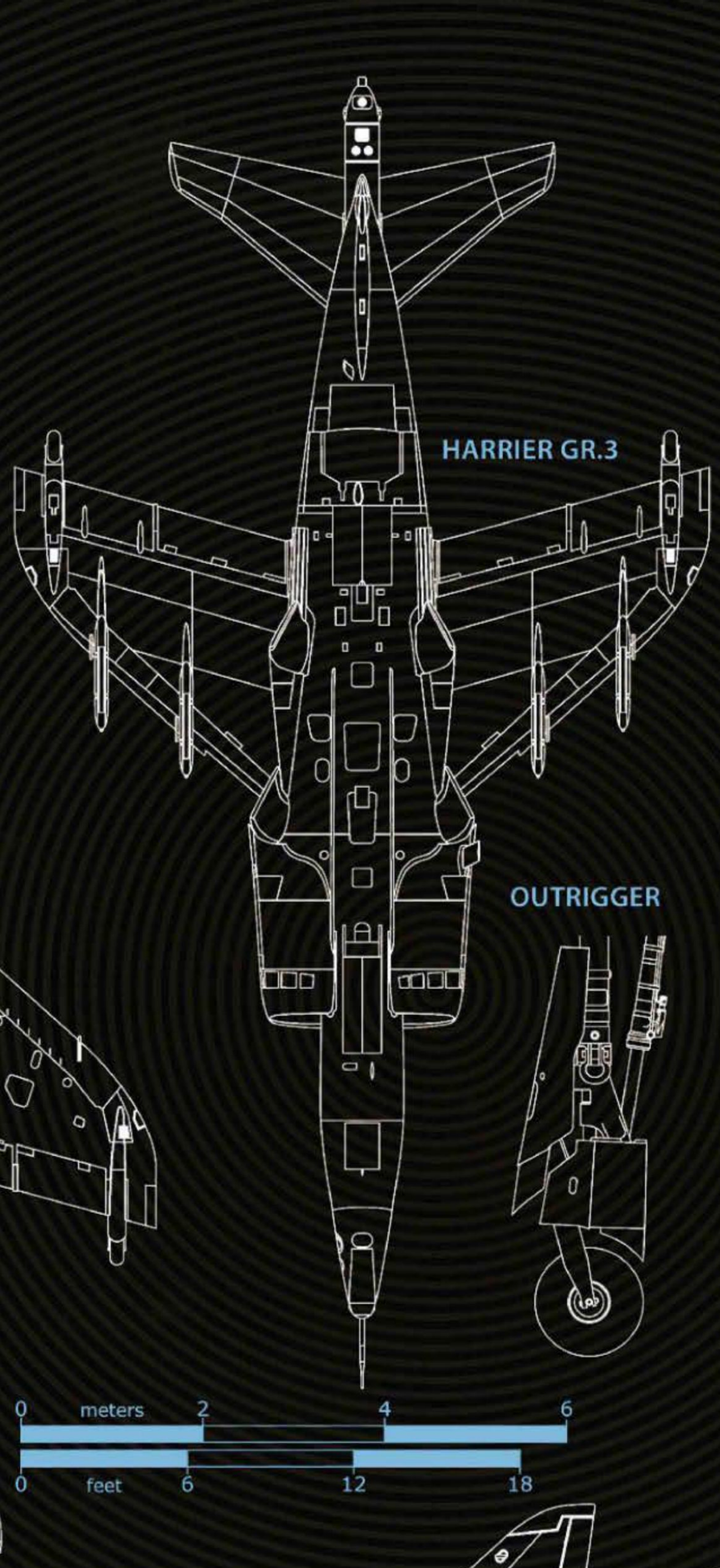



| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| P.1127 | 41FT 2IN / 12.55M EX PROBE | 24FT 4IN / 7.42M | 10FT 9IN / 3.28M | PEGASUS 2 |
| KESTREL | 22FT 10IN / 12.8M | 22FT 11IN / 6.98M | 10FT 9IN / 3.28M | PEGASUS 5 |
| GR.1 | 45FT 8IN / 13.92M | 25FT 3IN / 7.7M | 11FT 3IN / 3.43M | PEGASUS 6 MK.101 |
| GR.3 | 46FT 10IN / 14.28M | 25FT 3IN / 7.7M | 11FT 11IN / 3.63M | PEGASUS 11 MK.103 |
| FRS.1 | 47FT 7IN / 14.5M | 25FT 3IN / 7.7M | 12FT 2IN / 3.71M | PEGASUS 11 MK.104 |
| FA.2 | 46FT 6IN / 14.2M | 25FT 3IN / 7.7M | 12FT 2IN / 3.71M | PEGASUS 11 MK.106 |
| GR.5 | 46FT 4IN / 14.12M | 25FT 3IN / 7.7M | 11FT 8IN / 3.56M | PEGASUS 11-21 MK.105 |
| GR.7 | 46FT 4IN / 14.12M | 30FT 4IN / 9.25M | 11FT 8IN / 3.56M | PEGASUS 11-21 MK.105 |
| GR.9 | 46FT 4IN / 14.12M | 30FT 4IN / 9.25M | 11FT 8IN / 3.56M | PEGASUS 11-21 MK.107 |
| T.2 | 55FT 9.5IN / 17.04M | 25FT 3IN / 7.7M | 12FT / 3.66M | PEGASUS 6 MK.101 |
| T.4 | 57FT 2IN / 17.42M | 25FT 3IN / 7.7M | 13FT 8IN / 4.17M | PEGASUS 11 MK.103 |
| T.10 | 55FT 9IN / 17M | 25FT 3IN / 7.7M | 13FT 8IN / 4.17M | PEGASUS 11-21 MK.105 |
| T.12 | 55FT 9IN / 17M | 25FT 3IN / 7.7M | 13FT 8IN / 4.17M | PEGASUS 11-21 MK.107 |

# HAWKER SIDDELEY/BAE HARRIER

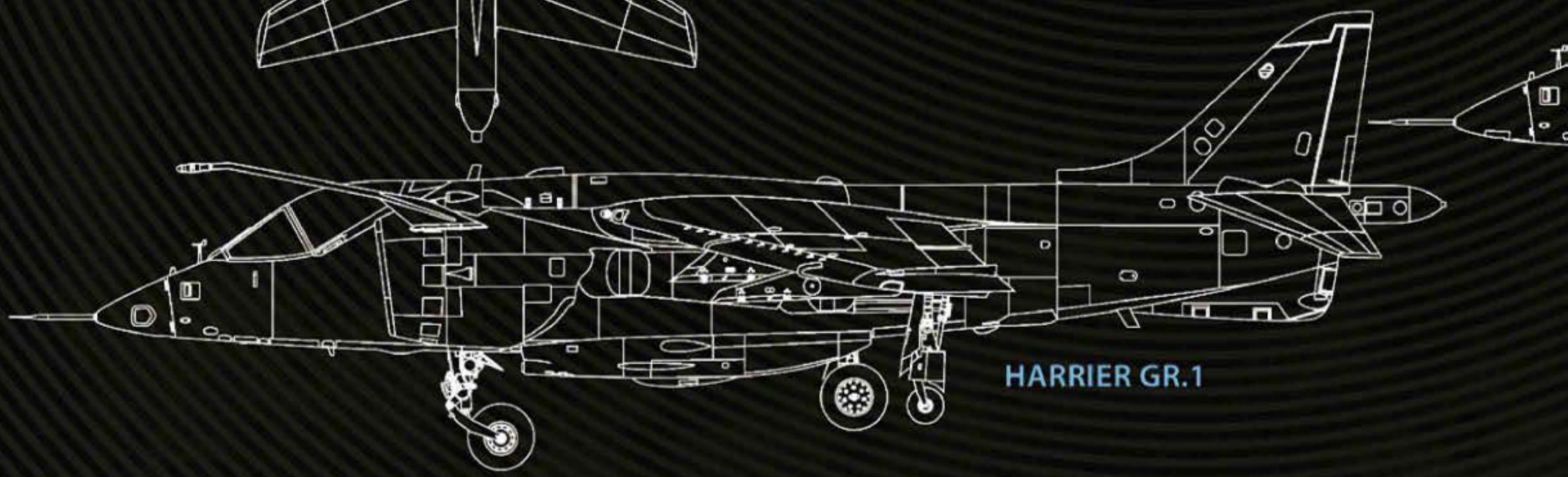
PLANS: 1967-2010





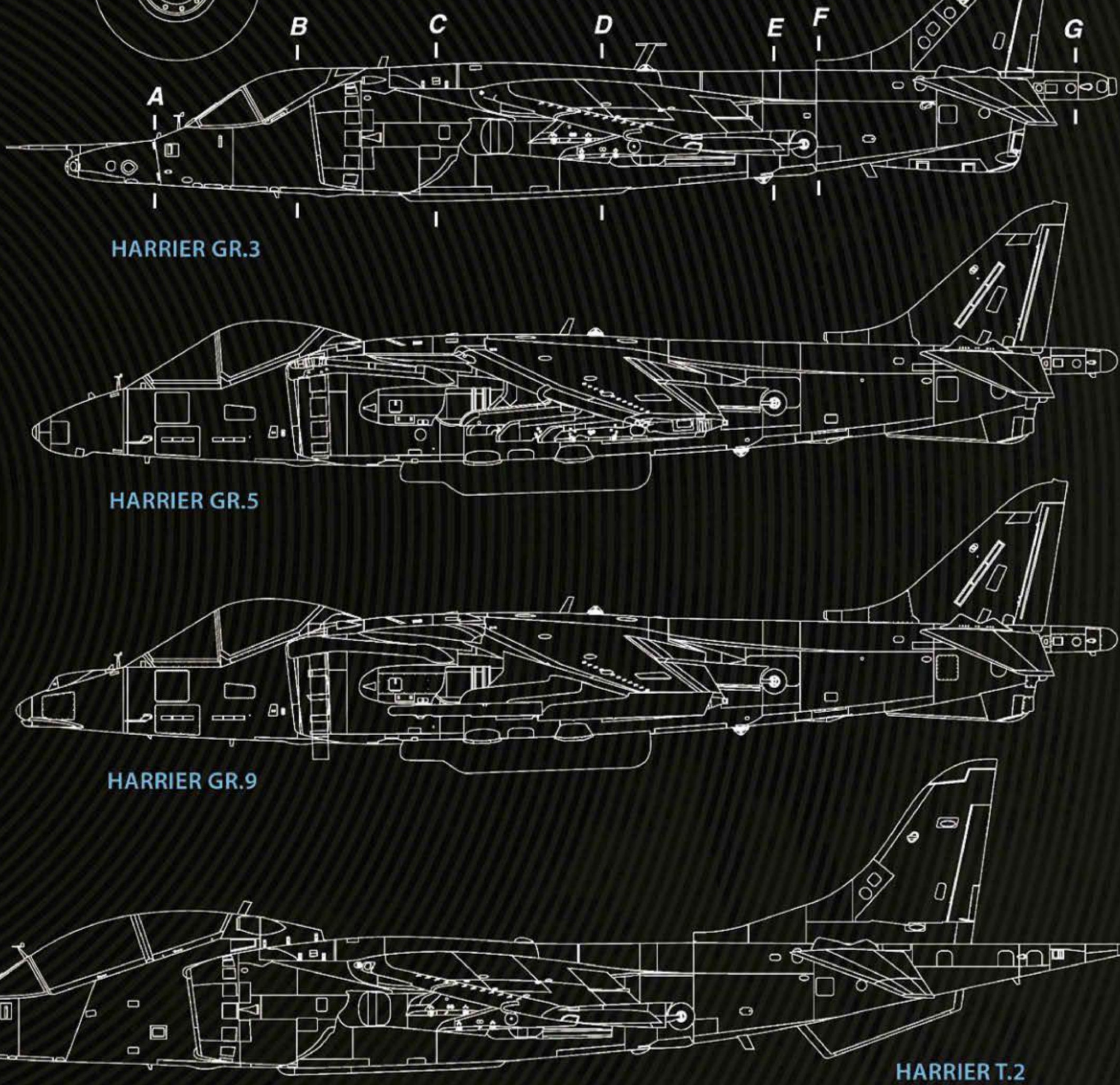




NOSE WHEEL

MAIN WHEEL

HARRIER GR.3




HARRIER GR.3

HARRIER GR.5

HARRIER GR.9

HARRIER T.2

# BLACKBURN BUCCANEER

1958-1994

**It may have been born out of Cold War necessity but the Buccaneer was never intended for RAF use, nor was it wanted by the RAF. The cancellation of the TSR2 and the failure of the F-111K materialise, however, left the Buccaneer as the only option and it is what the RAF received.**

As a response to the threat posed by Soviet shipping, the Royal Navy needed something that could strike back. The Buccaneer was designed for carrier operations and was a Navy jet through and through. So it is perhaps surprising that it was used for so long and so extensively by the RAF, flying operational sorties during the first Gulf War and coming to be loved by the crews who got to know it. Perhaps it is ironic that the most recognisable and successful of Blackburn's aircraft was to be

## BUCCANEER-S2B XW544 16 SQN

**Having entered service with 15 Sqn, RAFG Laarbruch, West Germany in June 1972, XW544 transferred to 16 Sqn in 1979. Following retirement in May 1985 it ended up at Bruntingthorpe as a ground runner. Standard RAF wrap around of Dark Sea Grey and Dark Green.**

**MOST OF THE FLIGHT TESTING AND EARLY HISTORY OF THE BUCCANEER FOCUSES ON PREPARING THE AIRCRAFT FOR CARRIER OPERATIONS**

the company's only foray into jet aircraft and the last from this manufacturer.

During the postwar years, the Soviet fleet saw the introduction of Sverdlov class cruisers which were perceived as a very serious threat by the Admiralty, being far superior to anything that NATO was operating at the time. To neutralize this threat, an aircraft was required to fly below enemy radar at a high enough speed for a surprise attack.

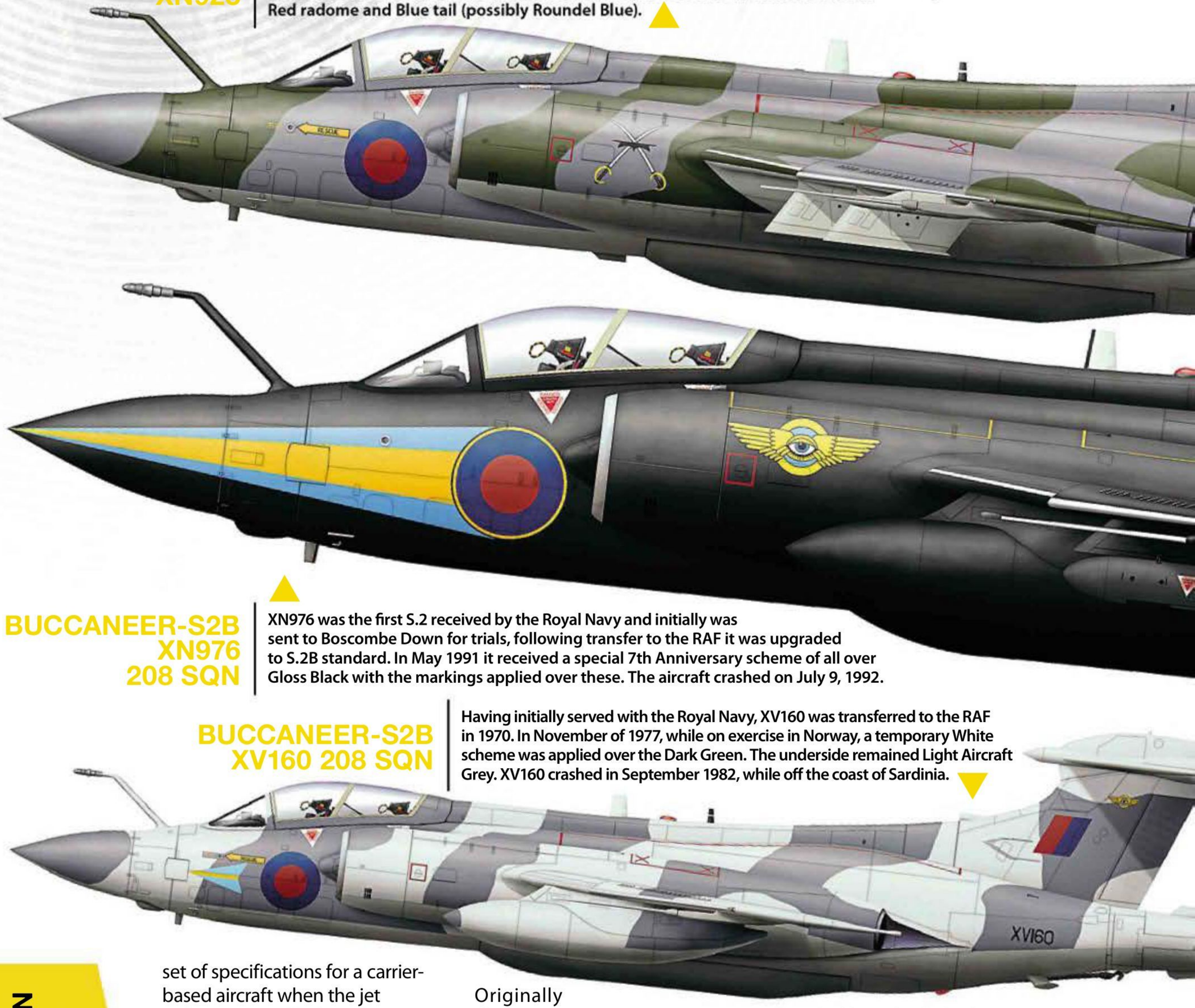
During a time when the RAF was still convinced that high altitude bombing was the way forward, this displays remarkable foresight by the Admiralty – as the later switch to low level by the V force and requirements for the Jaguar were to prove.

Specification M148T was issued in June 1952 and laid out the requirement for an aircraft that could fly under enemy radar at 200ft/61m, have a range of over 400 nautical miles at 550 knots while carrying a payload of 4000lb/1814kg of either conventional or nuclear weapons. It also had to be able to detect enemy shipping with radar and had to have a wingspan of no more than 20ft/6m and length not in excess of 51ft/15.5m when stored. This was quite a formidable

# BLACKBURN BUCCANEER

**BUCCANEER-S1 XN923**

Buccaneer S.1 XN923 was assigned to A&AEE in July 1962 for trials, having spent two months with 700Z flight. It was used exclusively for trials until struck off charge on May 17, 1974, and is currently on display at Gatwick Aviation Museum and ground running. Its scheme upon retirement was over all White with Red radome and Blue tail (possibly Roundel Blue).

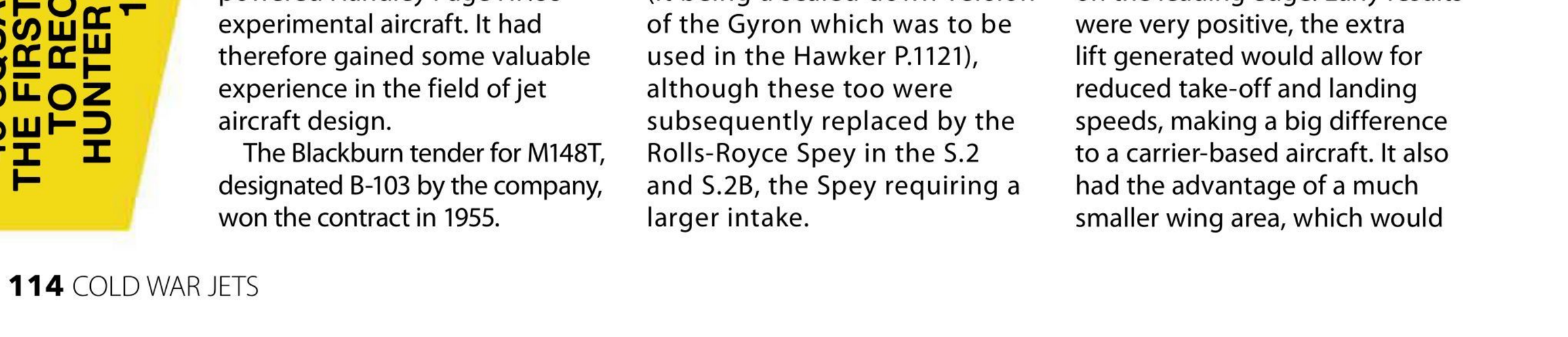


**BUCCANEER-S2B XN976 208 SQN**

XN976 was the first S.2 received by the Royal Navy and initially was sent to Boscombe Down for trials, following transfer to the RAF it was upgraded to S.2B standard. In May 1991 it received a special 7th Anniversary scheme of all over Gloss Black with the markings applied over these. The aircraft crashed on July 9, 1992.

**BUCCANEER-S2B XV160 208 SQN**

Having initially served with the Royal Navy, XV160 was transferred to the RAF in 1970. In November of 1977, while on exercise in Norway, a temporary White scheme was applied over the Dark Green. The underside remained Light Aircraft Grey. XV160 crashed in September 1982, while off the coast of Sardinia.




**43 SQUADRON WAS THE FIRST SQUADRON TO RECEIVE THE HUNTER F.1 IN JULY 1954**

set of specifications for a carrier-based aircraft when the jet industry was still relatively young.

At that time, Blackburn was producing the Beverley piston engine transport but had been involved in the construction and testing of the Rolls-Royce Nene-powered Handley Page HP.88 experimental aircraft. It had therefore gained some valuable experience in the field of jet aircraft design.

The Blackburn tender for M148T, designated B-103 by the company, won the contract in 1955.

Originally the Armstrong Siddeley Sapphire engine was to be used for the production model Buccaneer S.1, but it flew instead with two de Havilland Gyron Junior engines (it being a scaled down version of the Gyron which was to be used in the Hawker P.1121), although these too were subsequently replaced by the Rolls-Royce Spey in the S.2 and S.2B, the Spey requiring a larger intake.

Blackburn had also begun experiments with boundary layer control, taking the concept utilised in the F-104 where it was blown across the lift generated by flaps and exploring the effects on the leading edge. Early results were very positive, the extra lift generated would allow for reduced take-off and landing speeds, making a big difference to a carrier-based aircraft. It also had the advantage of a much smaller wing area, which would

## BUCCANEER-S2A XT273 237 OCU

**Constructed as an S.2, XT273 was converted to S.2A while still with the Royal Navy, in June 1975 it was transferred to 237 OCU where this scheme was applied. At this stage the underside was still Light Aircraft Grey but it wore the later style roundels.**

in turn be beneficial for low-level high-speed flight. This did lead to an increase in nose down pitching, but that was overcome by adding a blowing slit to the underside of the tailplane to compensate.

The final key design feature, which led to the very distinctive Coke bottle look of the Buccaneer, was the application of the area rule. As an aircraft approaches the speed of sound shockwaves build up, in particular the cross sectional area where the wings are. A convection of the fuselage would counter this and is a feature of many aircraft, however it is especially noticeable in the profile of the Buccaneer.

Most of the flight testing and early history of the Buccaneer focuses on preparing the aircraft for carrier operations and the role of the Naval squadrons, and it was not until July 1968 that the Ministry of Defence told the RAF it was getting the Buccaneer. An order was raised for 26 S.2s.

As the Royal Navy wound down its large carriers during the 1970s, the FAA Buccaneers were fed into RAF squadrons, providing a steady supply of additional aircraft to complement the new-delivery aircraft. The first of these, XV350, was delivered to 12 Squadron when it reformed on October 1, 1969, at RAF Honington. At this time the RAF had not made the move to the low visibility roundel and all over camouflage, so early aircraft were finished in gloss Dark Green and Dark Sea Grey with Light Aircraft Grey, the roundels retaining their ring of white.

In January 1970, the first of the new purpose-built RAF Buccaneers flew

## BUCCANEER-S2B XV352 208 SQN

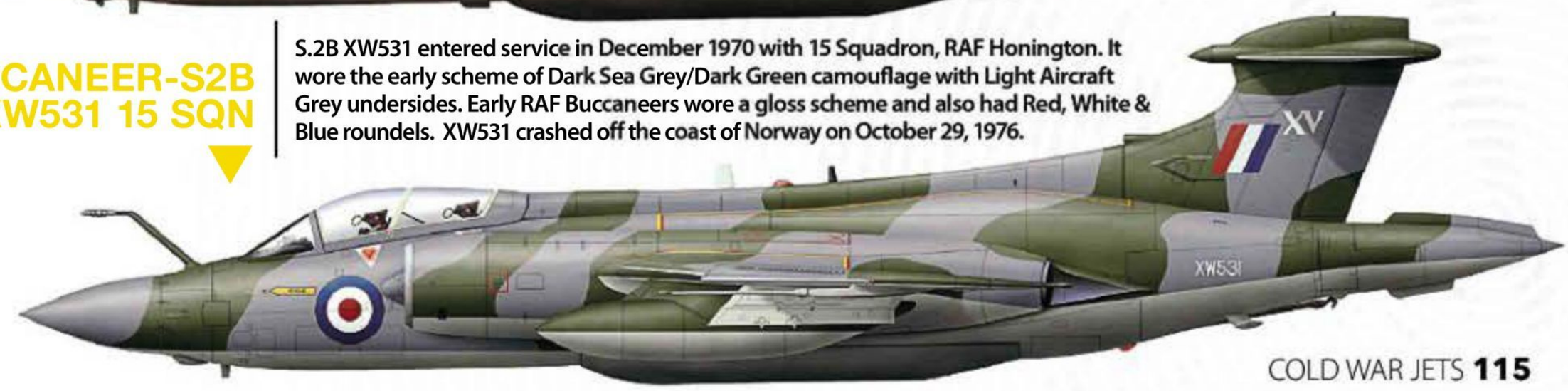
**While taking part in the Red Flag exercise at Nellis AFB in August 1977, XV352 had a temporary scheme of Dark Earth and Light Stone applied over most areas except the nose and tail. The scheme was removed shortly after its return to RAF Honington.**

## BUCCANEER-S2B XV863 OP GRANBY

**XV863 was delivered to the Royal Navy in 1968 and saw active service in the Gulf War during Operation Granby. It remained there for just over a month in the Pavespike laser designation role. It wore the nose art Sea Witch Debbie and six mission symbols on the starboard side. A temporary scheme of Desert Pink was applied and this quickly weathered. XV863 is currently on display at Weston Airport, Dublin.**

## BUCCANEER-S2B XW531 15 SQN

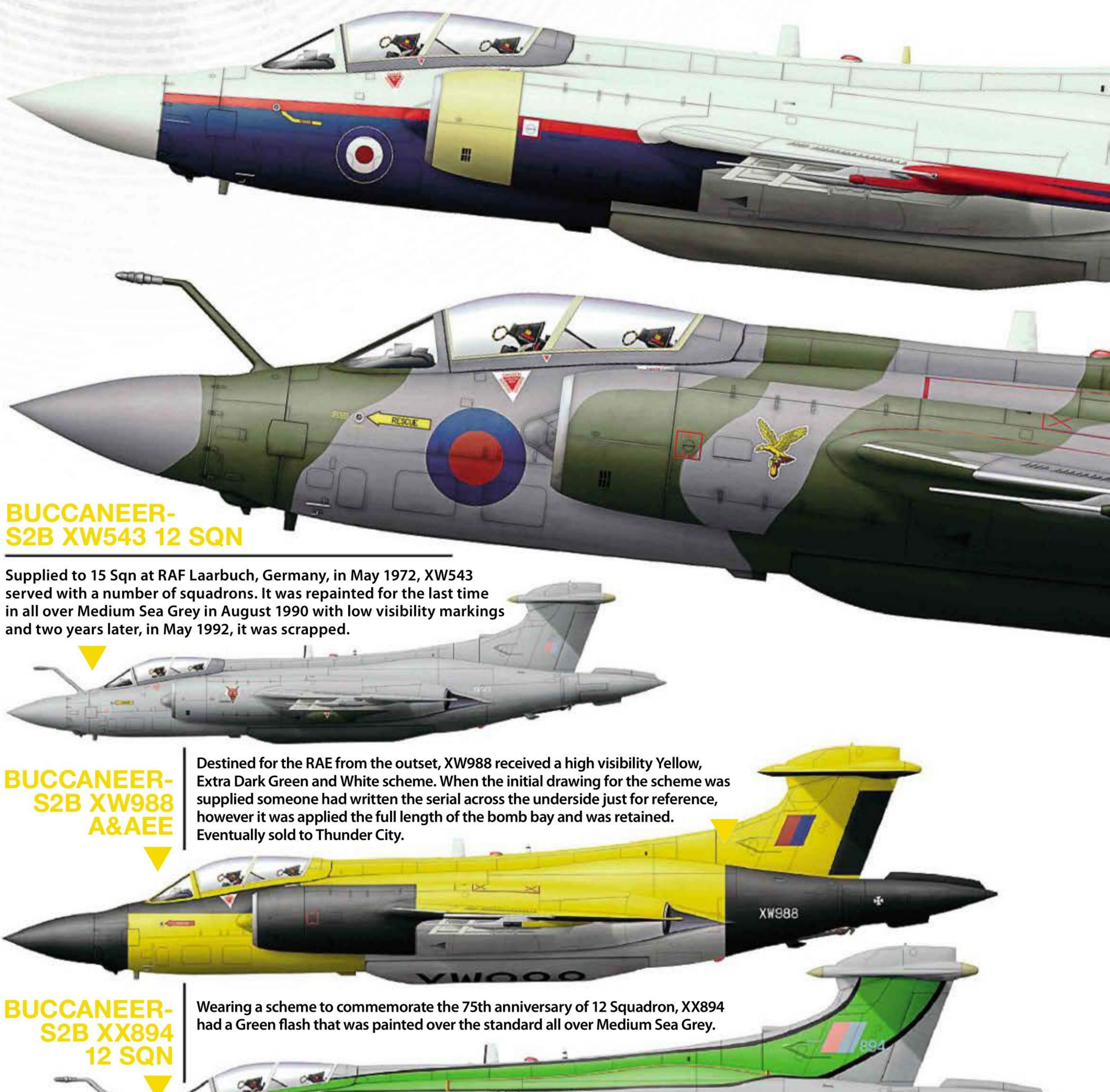
**S.2B XW531 entered service in December 1970 with 15 Squadron, RAF Honington. It wore the early scheme of Dark Sea Grey/Dark Green camouflage with Light Aircraft Grey undersides. Early RAF Buccaneers wore a gloss scheme and also had Red, White & Blue roundels. XW531 crashed off the coast of Norway on October 29, 1976.**



and by the start of October there were sufficient aircraft to re-equip 15 Squadron. Shortly after re-forming, also at RAF Honington, they were moved to RAF Laarbruch, West Germany. 15 Squadron was joined by 16 Squadron in West Germany when it re-formed in January 1973.

The next summer, 208 Squadron was to join 12 Squadron and 237 OCU at RAF Honington. The final Buccaneer squadron was the short-lived 216 Squadron which was formed with the intention of being a Maritime Strike unit, however the Buccaneer fleet was grounded following a fatal accident at Red Flag, Nevada, in 1980. Subsequent inspections revealed that fatigue had caused the front spar to fail. Many aircraft were repaired but some were scrapped. As a result, 216 Squadron never became operational due to a shortage of airframes and the aircraft were allocated to 12 Squadron instead.

Once the Buccaneer had been cleared to fly, the squadrons relocated from RAF Honington to RAF Lossiemouth. As part of the UN intervention in Lebanon, some Buccaneers were tasked with supporting the British




## BUCCANEER-S2B XW543 12 SQN

Supplied to 15 Sqn at RAF Laarbuch, Germany, in May 1972, XW543 served with a number of squadrons. It was repainted for the last time in all over Medium Sea Grey in August 1990 with low visibility markings and two years later, in May 1992, it was scrapped.

## BUCCANEER-S2B XW988 A&AEE

Destined for the RAE from the outset, XW988 received a high visibility Yellow, Extra Dark Green and White scheme. When the initial drawing for the scheme was supplied someone had written the serial across the underside just for reference, however it was applied the full length of the bomb bay and was retained. Eventually sold to Thunder City.




## BUCCANEER-S2B XX894 12 SQN

Wearing a scheme to commemorate the 75th anniversary of 12 Squadron, XX894 had a Green flash that was painted over the standard all over Medium Sea Grey.

## BUCCANEER-S2B XX901 208 SQN

**Delivered to 208 Squadron on January 4, 1977, XX901 remained with them for a decade. As well as wearing 901 on the tail, it had a temporary 3 during exercises. It later served in the Gulf during Operation Granby. Now on display at Yorkshire Air Museum, Elvington.**

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| S.1 | 63FT 5IN / 19.33M | 42FT 4IN / 12.9M | 16FT 3IN / 4.95M | 2 X GYRON GUNIOR DGJ.1 |
| S.2 (FOLDED) | 51FT 10IN/ | 19FT 11IN / 5.99M | 16FT 8IN / 5.08M | 2 X RB.168-1A SPEY |
| S.2 (SHORT WING) | 63FT 5IN / 19.33M | 42FT 4IN / 12.9M | 16FT 3IN / 4.95M | 2 X RB.168-1A SPEY |
| S.2B (LONG WING) | 63FT 5IN / 19.33M | 44FT / 13.41M | 16FT 3IN / 4.95M | 2 X RB.168-1A SPEY |

## BUCCANEER-S2B XW987 A&AEE

**XW987 was commissioned specifically for the RAE and originally painted in a high visibility scheme before being repainted in a Raspberry Ripple scheme of Signal Red, White and Oxford Blue (all gloss) in May 1982. Retired in February 1995, it was sold to Thunder City, South Africa.**

## BUCCANEER-S2B XW540 216 SQN

**216 Squadron's association with the Buccaneer was brief, only having the type for six months from July 1979 and never officially became operational, the squadron badge being applied to the fuselage. All aircraft including XW540 were subsequently passed to 12 Squadron.**

peacekeepers during Operation Pulsator. Six were based at RAF Akrotiri in the autumn of 1983 and two overflew Beirut in a show of force.

As the Tornado entered service, the Buccaneer's days as a strike aircraft were numbered, but in 1991 the Buccaneer was given the opportunity for a swansong. At very short notice (three days) the remaining squadrons were tasked with preparing the Buccaneer for a laser designation role, using the Westinghouse AN/ASQ-23E laser pod, to support the Tornados.

An all over Desert Pink scheme was hastily applied and the 12 aircraft flew out to the Gulf region. Once there, the conditions meant that the paint scheme faded and weathered rapidly. Like other RAF aircraft involved in Operation Granby, the Buccaneers all received nose art too.

Upon their return the remaining Buccaneers were to have their desert scheme replaced with a new all over Medium Sea Grey and Camouflage Grey scheme with revised national markings. This was a short-lived scheme as the type was officially retired on March 31, 1994. To commemorate the event, Buccaneers were painted up in the schemes of the RAF squadrons that had flown the type and one was painted in 809 NAS colours as a tribute to its naval origins.

Despite its performance and reputation, the Buccaneer only saw export to South Africa – with Bristol Siddeley BS.605 rocket engines installed in the rear fuselage to aid take-off from high altitude airfields – and even then numbers were limited due to the fear that it could be used to keep apartheid in place.

Interest was also expressed by West Germany but the sale never went through. Since retirement, several Buccaneers have ended up being kept in serviceable condition and continue to taxi regularly. There are also airworthy examples in South Africa. For an aircraft that the RAF never wanted and only reluctantly accepted it became much loved by all those involved and was missed when it was eventually retired.

**FOR AN AIRCRAFT THAT THE RAF NEVER WANTED AND ONLY RELUCTANTLY ACCEPTED IT BECAME MUCH LOVED BY ALL THOSE INVOLVED AND WAS MISSED WHEN IT WAS EVENTUALLY RETIRED**

# BLACKBURN BUCCANEER

## PLANS: 1958-1994

BUCCANEER S.2B

BUCCANEER S.2B

MAIN WHEEL

NOSE WHEEL

0 meters 2 4 6

0 feet 6 12 18

BUCCANEER S.2B FOLDED WINGS

A

B

C

D

E

F

BUCCANEER S.2B

BUCCANEERS.2B

# SEPECAT JAGUAR

1968-2007

**The Jaguar was a direct result of Cold War requirements, born out of the changing role of air defence and going against the practices that were developed and considered conventional by the Air Ministry – which had developed these theories during the Second World War. Changes in Soviet defences forced the Vulcan and Victor to swap from high altitude to low level operations. In addition, the cancellation of projects such as the Hawker P.1154 and the TSR2 left a gap. It was this role that the Jaguar was ultimately to fill.**

The Jaguar was built as a low level ground-attack fighter fulfilling a range of roles with a single aircraft. RAF Jaguar squadrons spent many years based in West Germany but the only conflicts they were involved in were the first Gulf War of 1991 and Bosnia in 1995. In 31 years of RAF service the type served with distinction and was the last of the Cold War warriors.

During the early 1960s both the British and French were looking to replace their fast jet trainers, the Fouga Magister in France, the Hunter and Gnat in the UK. The French had begun development of the ECAT, which was intended to be both a trainer and light attack aircraft. Following cancellation of the project, aspects of the ECAT (and TSR2) were fed into the Jaguar programme. The two nations

**THE JAGUAR WAS BUILT AS A LOW LEVEL GROUND-ATTACK FIGHTER FULFILLING A RANGE OF ROLES WITH A SINGLE AIRCRAFT**

## JAGUAR GR3 XX725 54 SQN

**Jaguars were frequently deployed to Norway and several experimental schemes were applied. This late scheme, applied to XX725 during early 2005, was a temporary scheme of White over Barley (Camouflage Grey) in a traditional camouflage pattern.**

were both looking for an aircraft with similar requirements and in the climate of European cooperation and collaboration, which also led to the Gazelle and Concorde, the Anglo-French company SEPECAT (Société Européenne de Production de l'Avion d'École de Combat et d'Appui Tactique) was formed in 1965.

It was originally intended for the aircraft to be variable geometry and each nation agreed to purchase 150 with the two-seater variant being the preferred choice for the RAF and RN. Escalating costs became such a concern, however, that the French withdrew their initial order and altered their requirements. The British revised their order, reducing the number of two-seaters and raising an order for a single seat strike variant. With Royal Navy interest rapidly waning, the aircraft would just be for RAF, making up for the cancellation of other projects.

The name was only settled on a week before the project was due to be announced at the Paris

# SEPECAT JAGUAR

**THE GR.1 WAS DESIGNED TO BE FLEXIBLE AND EVOLVE WITH THE CHANGING TENSION THAT WAS ANTICIPATED IN THE 70s AND 80s**

Airshow in 1965 with permission to use it being sought from Jaguar cars. Design progressed at a steady pace and two years later at the 1967 Paris Air Show a wooden mock up was displayed, though it suffered in heavy rain and started to sag.

Not only was a new aircraft developed but a new engine was also created to fit the Jaguar. Based on the Rolls-Royce RB172, the Ardour was the result of a partnership between Turbomeca and Rolls-Royce. The project suffered many delays and the prototype was underpowered and suffered teething problems to such an extent that the first three airframes had been completed but only three engines had been built.

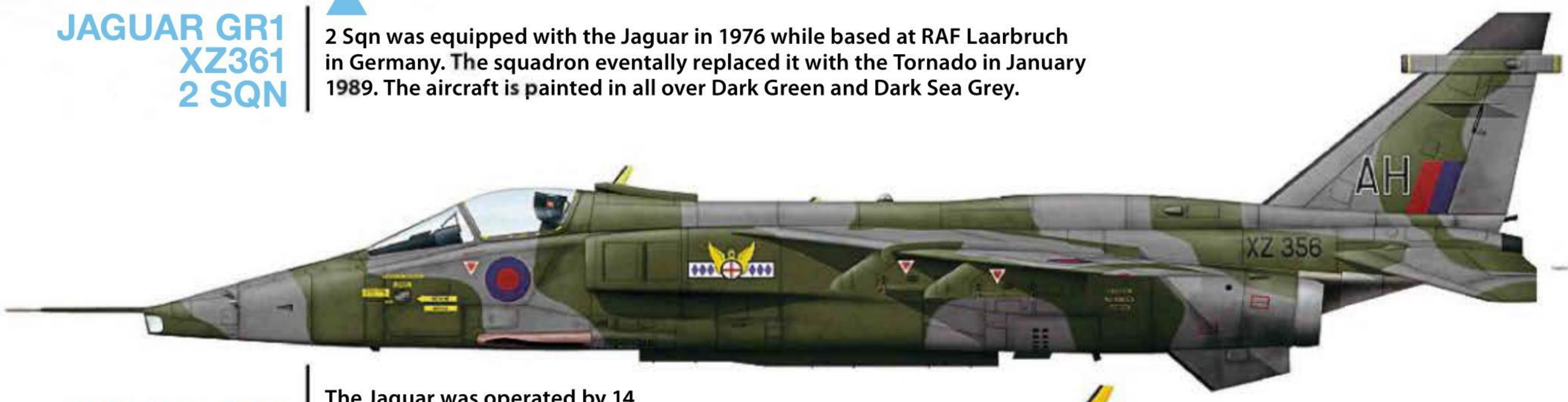
The Ardour was designed for low fuel consumption and to be able to cruise at low level but also high thrust needed to be available for take-off and to reach supersonic speeds. It did not help matters when Rolls-Royce filed for bankruptcy in 1971. Once it was completed, however, the Ardour proved to be a reliable engine, also being used in the Hawk and Goshawk.

Eventually engines were fitted and taxiing trials commenced. These were followed on September 8, 1968, at Istres, France, with the first flight of a Jaguar taking place. Bernard Witt, Breguet's chief test pilot, was at the controls. He was impressed with the handling of the Jaguar and pleased with the incident-free flight. Over the next few months three more prototypes flew in France. Then the first British-built Jaguar S06 made its maiden flight from Warton, Lancashire, on October 12, 1969. Over the next few years an extensive testing programme took place with the six prototypes, two more being added.

The GR.1 was designed to be flexible and evolve with the changing tension that was anticipated in the 70s and 80s, key to this was the accuracy of the delivery system. A digital inertial navigation system, the

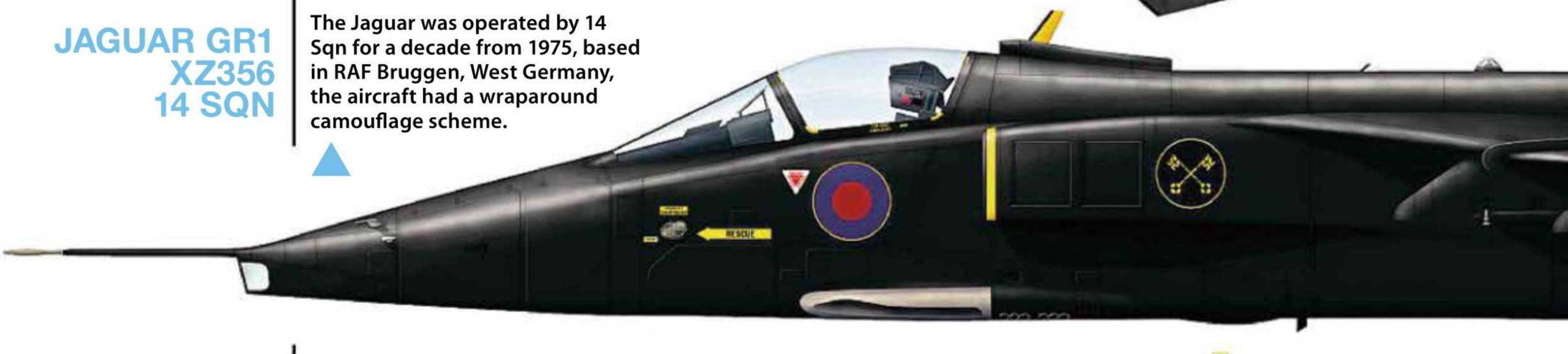
## JAGUAR GR1 XZ361 2 SQN

2 Sqn was equipped with the Jaguar in 1976 while based at RAF Laarbruch in Germany. The squadron eventally replaced it with the Tornado in January 1989. The aircraft is painted in all over Dark Green and Dark Sea Grey.




## JAGUAR GR1 XZ356 14 SQN

The Jaguar was operated by 14 Sqn for a decade from 1975, based in RAF Bruggen, West Germany, the aircraft had a wraparound camouflage scheme.




## JAGUAR GR1 XX821 17 SQN

Having previously had a Light Aircraft Grey underside when the squadron received Jaguars in September 1975 it was later painted in all over Dark Sea Grey and Dark Green upper surfaces. The squadron was re-equipped with the Tornado in 1985.

## JAGUAR GR1
## XZ107
## 41 SQN

Most schemes worn by the Jaguar were a variation on standard camouflage, covering the Dark Green, but a different approach to this scheme was taken with XZ107 in April 1988. By the time the exercise had finished the paint had run and worn off over much of the airframe.

## JAGUAR GR1
## XZ387
## 31 SQN

31 Sqn remained in West Germany when it converted from the Phantom to Jaguar in 1976, its aircraft painted in typical wraparound scheme. The squadron also had eight WE.177 nuclear bombs which could be delivered by the Jaguar.

## JAGUAR GR1
## XX818
## 20 SQN

Between flying the early and late Harriers, 20 Sqn received 12 Jaguars in 1997 while at RAF Bruggen, West Germany. The Jaguars were replaced with Tornados in 1984.

## JAGUAR GR1
## XX116
## 16 SQN

From 1955 until 1969, 54 Squadron operated several variants of the Hunter including the FGA.9 while based at RAF West Raynham in the late 1960s.

# COLD WAR JETS SEPECAT JAGUAR

**JAGUAR GR1**
**XZ398**
**41 SQN**

Painted with a Red tail and spine with White edging, XZ398 wore a 75 years anniversary scheme. The aircraft continued to fly with this scheme for several years before being repainted in late 1993.

**JAGUAR GR1**
**XX763**
**226 OCU**

Reformed at RAF Lossiemouth in 1974 for conversion to the Jaguar, 226 OCU was also equipped with the WE.177 and would have been a front line squadron in the event of war breaking out.

**JAGUAR GR1**
**Z356**
**14 SQN**

The Jaguar was operated by 14 Sqn for a decade from 1975, based in RAF Bruggen, West Germany, the aircraft had a wraparound camouflage scheme.

**BOTH BRITISH AND FRENCH JAGUARS WERE DEPLOYED DURING THE FIRST GULF WAR, OPERATION GRANBY WITH 12 RAF JAGUARS FLYING**

Marconi-GEC 920ATC, was fitted along with the advanced Laser Rangefinder and Marked Target Seeker (LRMTS). As the Ardour 104 became available, the GR.1s were upgraded and it was fitted to new aircraft.

Early in 1973 the French Air Force and RAF prepared to receive the type and commence conversion to the Jaguar. The first handover took place at RAF Lossiemouth on May 30, 1973, to the Jaguar OCU, trials and training being initiated soon after. Deliveries of the GR.1 and T.2 continued throughout the year. The following year the Jaguar was ready to enter front line service, 54 Squadron officially received the GR.1 during a ceremony on June 5, 1974, (the OCU was numbered 226 at this time). Also present at the ceremony was a Jaguar in 6 Sqn markings, this one was also fitted with the LRMTS nose which would be a distinguishing feature of RAF Jaguars. Later in the year the Jaguar force relocated to RAF Coltishall, the station becoming the permanent home of the Jaguar fleet.

The following spring the first two squadrons to be based in West Germany were formed, 14 Sqn forming in April and 17 Sqn in June. These were later followed by 2, 11 and 31 Squadrons also in West Germany. Finally 41 Sqn converted and 20 Sqn exchanged the Harrier GR.3 for the Jaguar (the squadron later returned to the Harrier when 233 OCU was renumbered).

Beginning in 1983, the navigation system was replaced with the Ferranti FIN 1064 navigation sytem and the type was designated the GR.1A. Subsequent minor upgrades saw the type become the GR.1B though externally there were no noticeable differences. This was followed by yet more changes including the introduction of the Ardour 106

## JAGUAR GR1
## XZ112
## 54 SQN

Based at RAF Coltishall, 54 Squadron was one of the longest operating Jaguar squadrons (1974-2005). XZ112 received a special Blue tail and tank in 1991 for the squadron's 75th anniversary.

## JAGUAR GR1
## XC XZ103

An experimental scheme was applied to XZ103, Light Aircraft Grey with upper surfaces painted Desert Pink when it took part in trials during 2002 at China Lake, California.

## JAGUAR GR1
## XX733
## 14 SQN

During Operation Granby, 6, 41 and 54 Squadrons supplied Jaguars. The aircraft were painted in Desert Pink, though this rapidly faded in the desert. It completed 39 missions, nose art being painted by Cpl Paul Robins.

| VARIANT | LENGTH | SPAN | HEIGHT | ENGINE |
|---|---|---|---|---|
| S | 55FT 2.5IN/16.83M | 28FT 6IN/8.69M | 16FT 10.5IN/5.14M | 2 X ADOUR 102 |
| GR1A | 55FT 2.5IN/16.83M | 28FT 6IN/8.69M | 16FT 10.5IN/5.14M | 2 X ADOUR 102 |
| T2 | 57FT 6IN/17.53M | 28FT 6IN/8.69M | 16FT 10.5IN/5.14M | 2 X ADOUR 104 |
| GR3 | 55FT 2.5IN/16.83M | 28FT 6IN/8.69M | 16FT 10.5IN/5.14M | 2 X ADOUR 106 |
| T4 | 57FT 6IN/17.53M | 28FT 6IN/8.69M | 16FT 10.5IN/5.14M | 2 X ADOUR 106 |
| GA.11 | 45FT 11IN/14M | 33FT 8IN/10.26M | 13FT 2IN/4.01M | AVON 121 |

## JAGUAR GR3
## XX112 6 SQN

Celebrating the 90th anniversary of 'The Flying Canopeners' in 2004, the tail was painted Light Blue and bears the squadron's battle honours.

to the Jaguar 96 programme resulting in the GR.3.

Both British and French Jaguars were deployed during the first Gulf War, Operation Granby with 12 RAF Jaguars flying a total of 617 combat missions against a range of targets, including SAM and artillery sites, also accounting for 15 ships of the Iraqi Navy. The aircraft and crews were drawn from 6, 41 and 54 Squadrons as well as 226 OCU, arriving in the Gulf during October 1990.

It was also intended for Jaguars to play an active role in Operation Telic, the second Gulf War, however there were deployment issues when Turkey withdrew permission to use its airfields. Between the two wars, the Jaguar was also used by the UN in the former Yugoslavia to attack Bosnian Serb targets and support Harrier GR.7s.

A trainer version was needed to convert pilots to the type, as with any advanced jet, but unlike other front line jets the Jaguar was originally intended to be a trainer until the requirements evolved. The French E and the RAF T.2 were close than the A and GR.1 in design but the biggest difference was to the

**JAGUAR GR3A XZ398 41 SQN**

Late Jaguars were painted in Barley Grey (now called Camouflage Grey), including XZ398, which was again selected to commemorate a 41 Squadron anniversary, this time the 85th.

**JAGUAR GR3 XX725 54 SQN**

Jaguars were frequently deployed to Norway and several experimental schemes were applied. This late scheme, applied to XX725 during early 2005, was a temporary scheme of White over Barley (Camouflage Grey) in a traditional camouflage pattern.

**JAGUAR T2 XX143 54 SQN**

54 Squadron also had trainers on strength such as this T.2 in wraparound camouflage. The Lion shield was on the nose and checks on the intake.




**JAGUAR T2 ETPS XX145**

Operated by the Empire Test Pilot School, XX145 wore the Raspberry Ripple scheme of the school, delivered in June 1974 it was retired to Bruntingthorpe, Leicestershire, in April 2012.

## JAGUAR T4 RAF XX847 6 SQN

A typical if somewhat weathered scheme was applied to both 6 Squadron's fighters and trainers. XX847 was photographed in 2007 with a camouflaged external tank at RAF Coningsby.

## JAGUAR T4 RAF XX846 16 SQN

Jaguar schemes became increasingly patchwork as time wore on and XX846 flew for a brief period in December 2001 with an unpainted nose panel. The overall scheme was a mixture of Camouflage Grey and Dark Sea Grey.

## JAGUAR P S06 XW560

The first single seat British Jaguar, before LRMTS was fitted. Lost in an engine fire in August 1972. Gloss Dark Green, Dark Sea Grey camouflage with Light Aircraft Grey underside.

avionic system, the T.2 mirroring the GR.1. It was also fitted with only one Aden cannon.

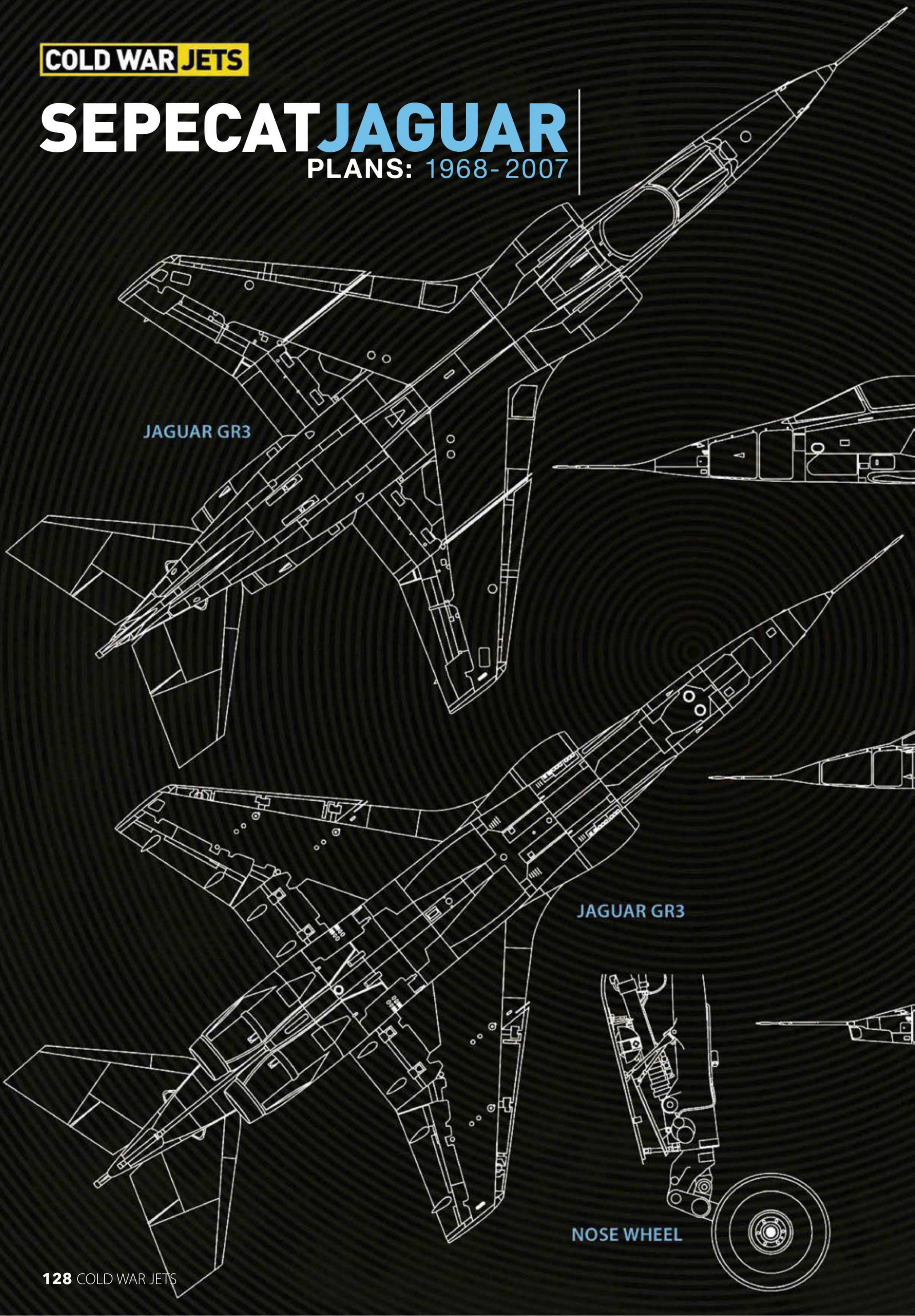
The RAF wanted the T.2 to have a secondary function where it would be able to fly full combat missions should such a requirement prove necessary. Without a refuelling probe the range was rather limited and the combat capability was so restricted that the circumstances would have had to be exceptionally dire for it to be used in anger. The T.4 was the result of the T.2 being upgraded as part of the Jaguar 96 programme and saw the aircraft receive the same enhancements as the GR.3.

The Jaguar saw over 30 years service with the RAF and a similar longevity with the French Air Force. It was also exported to Ecuador, India, Nigeria and Oman. 543 were built in total with 165 GR.1s and 38 T.2s being built for British service. Due to defence cuts, the RAF Jaguars were retired with just five days' notice on April 30, 2007. The Jaguar retired with distinction, having been involved in two conflicts and spending many years in West Germany with the RAF. Many airframes survived and some have since been used at RAF Cosford as instructional ground trainers.

**THE JAGUAR SAW OVER 30 YEARS SERVICE WITH THE RAF AND A SIMILAR LONGEVITY WITH THE FRENCH AIR FORCE**

# SEPECAT JAGUAR

## PLANS: 1968-2007



JAGUAR GR3

MAIN WHEEL

0 meters 2 4 6

0 feet 6 12 18

JAGUAR T2

A B C D E

JAGUAR GR3

A B C D E

# COLD WAR JETS COLOUR CHART

| COLOUR | BS NUMBER | FS NUMBER | METEOR | VAMPIRE | VENOM | CANBERRA | SWIFT | HUNTER | VALIANT | JAVELIN | VICTOR | VULCAN | BUCCANEER | LIGHTNING | HARRIER | JAGUAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIRCRAFT BLUE | BS381C:108 | | | | | | | ● | | | | | | | | |
| ALUMINIUM | | FS 37178 | ● | ● | ● | ● | ● | ● | | ● | | ● | | ● | | |
| BARLEY (CAMOUFLAGE GREY) | BS381C:626 | FS 36314 | | | | ● | | | | | | ● | | ● | | ● |
| BLACK | | | | | | ● | | | | | | | ● | ● | | ● |
| DARK CAMOUFLAGE GREY | BS381C:629 | | | | | | | | | | | | | ● | ● | |
| DARK EARTH | BS381C:350 | FS 20118 | | ● | | | | | | | | ● | | | | |
| DARK GREEN | BS381C:241 | | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● | ● | ● |
| DARK SEA GREY | BS381C:638 | FS 26173 | ● | ● | ● | ● | | | | ● | | ● | ● | ● | ● | ● |
| DAYGLO | | | ● | ● | | ● | | | | ● | | | | | | |
| DESERT PINK | | FS 30279 | | | | | | | | | | | ● | | | ● |
| GLOSS WHITE | | | | | | ● | | | ● | | ● | ● | | | | |
| HEMP | | FS 30450 | | | | | | | | | ● | | ● | | | |
| LICHEN GREEN | BS4800:12-25 | | | | | | | | | | | | | | ● | |
| LIGHT AIRCRAFT GREY | BS381C:627 | FS 26440 | ● | ● | ● | ● | | ● | | | ● | | | | ● | ● |
| LIGHT GULL GREY | | FS 16440 | | | | | | | | | | | | ● | | |
| LIGHT SLATE GREY | | FS 34159 | | | | ● | | | | | | | | | | |
| LIGHT STONE | | FS 23448 | | ● | | | | | | | | ● | | | | |
| MEDIUM SEA GREY | BS381C:637 | FS 26270 | | | | ● | | | ● | ● | ● | ● | | | | |
| NATO IRR GREEN | BS381C:285 | | | | | | | | | | | | | | ● | |
| NATURAL METAL | | | | | | | ● | | ● | | | | | ● | | |
| OCEAN | | FS 36152 | | ● | | | | | | | | | | | | |
| OLIVE GREEN | BS381C:220 | | | | | | | | | | | | | | | |
| OXFORD BLUE | BS381C:105 | FS 15050X | | | | | | ● | | | | | | | | ● |
| PRU BLUE | BS381C:636 | FS 35164 | | ● | ● | | | | | ● | | | | | | |
| RED | BS381C:537 | | ● | | | ● | | ● | | ● | | | | ● | | ● |
| WHITE | | | ● | | | | | ● | | ● | | | | | | ● |
| WHITEWASH | | | | | | | | | | | | | | | | ● |
| YELLOW | BSC381C:356 | | ● | ● | | | | | | | | | | | | |

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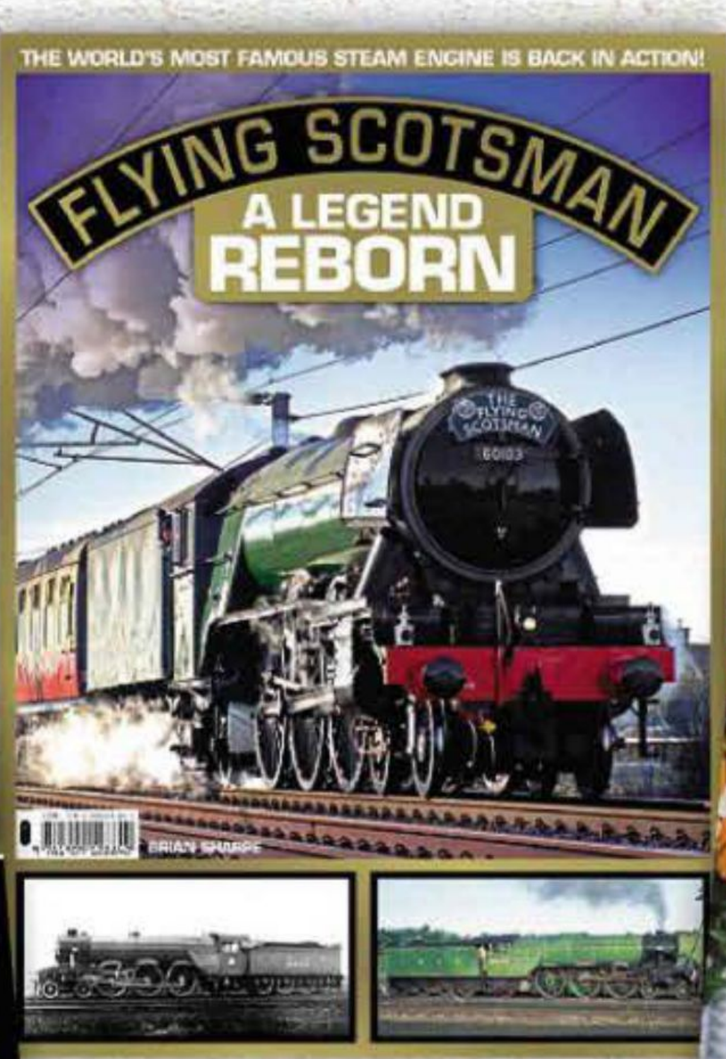

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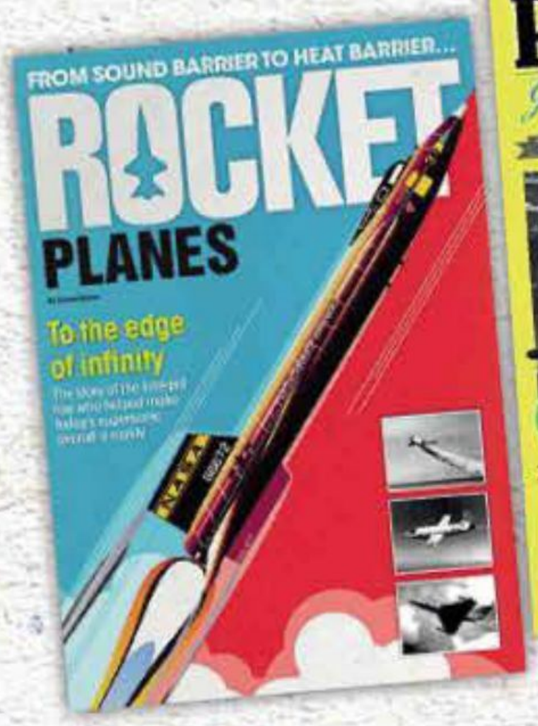


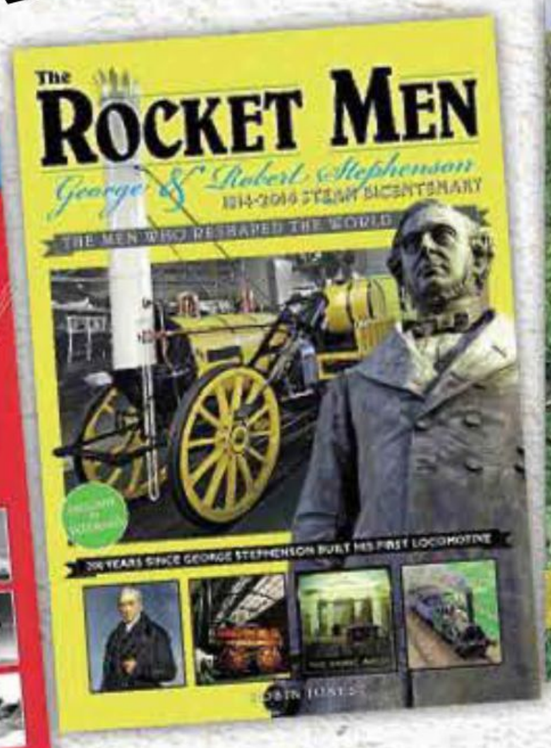
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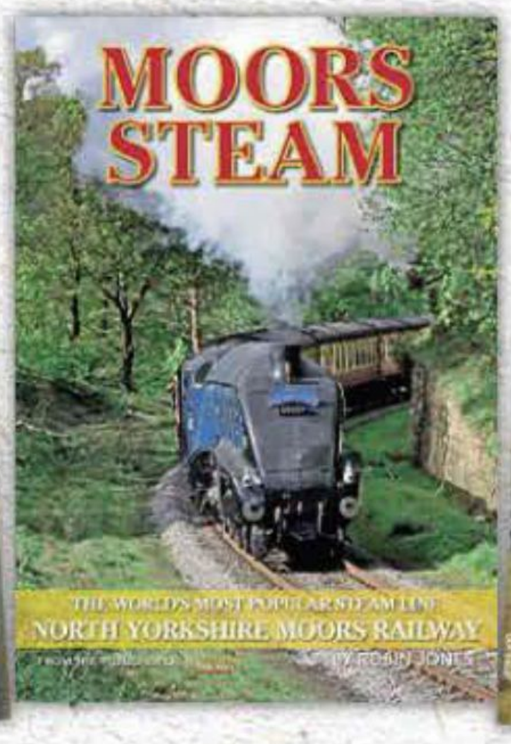

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